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THE INDEX OF OTOLARYNGOLOGY

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XLIII.

THREE CASES OF LARYNGEAL SPASM ASSOCIATED  
WITH INTRACRANIAL HEMORRHAGE  
IN THE NEWBORN.\*

BY DONALD MUNRO, M. D.,

BOSTON.

Symptomatic laryngeal stenosis in the newborn infant is ordinarily considered to be due to some form of airway obstruction. The commonest obstruction is in all probability due to intrathoracic pressure from the thymus. In addition, diphtheria and other infectious processes, excess secretion of mucus, edema from any cause, and the inhalation of foreign bodies should be mentioned.

Three cases are reported in which the presenting symptom was that of airway obstruction, but which at autopsy proved to be entirely normal in that respect. In each case the pathologic lesion was located in the lateral cerebral ventricles, and

\*Presented at the meeting of the Eastern Section of the American Laryngological, Rhinological and Otological Society, Boston, January 24, 1925.

consisted of an intraventricular hemorrhage with damage to the neighboring cortex, amounting in one case to actual perforation. In two cases the diagnosis was made antemortem. Of them, one was intubated without relief. The remaining case was not diagnosed, but was treated by X-ray, also without relief, on the theory that thymic pressure was the cause of the symptoms. These latter cases were both found to have prolonged bleeding and coagulation times, and consequently fall into the socalled hemorrhagic disease of the newborn class.

The first case follows:

Baby P., white female, first seen when three days old, with Dr. J. H. Huntington. Delivered by low forceps from a non-rotated posterior occiput position after a labor of sixteen hours. She was normal up to the third day, when she developed a shrill cry, became stuporous and refused to nurse. The physical examination was negative except for a tense anterior fontanelle and some scattered petechial hemorrhages in the roof of the mouth and in the left upper eyelid. The bleeding time was fifteen or more minutes, and the coagulation time nine minutes with the formation of a poor clot. A diagnosis of intracranial hemorrhage with hemorrhagic disease of the newborn was made. In the next seventeen hours 45 cc. of whole blood was given intramuscularly, with cessation of external bleeding and considerable general improvement. At this time the infant suddenly developed a marked respiratory difficulty with a "crow," making use of all the accessory respiratory muscles and showing at each breath a considerable sub- and suprasternal retraction. There was no cyanosis, and the position of the head had no influence on the symptoms. Lumbar puncture demonstrated old blood in the cerebrospinal fluid, with a normal intracranial pressure and no bloc. Two X-ray exposures were given, with no influence on the condition. Three hours later, having shown practically no change in condition in the interval, stertorous respiration suddenly developed, with cyanosis, and the patient began to have mild generalized convulsions. Another lumbar puncture done at this time gave temporary relief, but four hours later the child's condition began to grow steadily worse, and she died of respiratory paralysis shortly afterwards.

Autopsy showed no pathologic condition except in the head. The thymus weighed 10 grams. The lungs, larynx, trachea and bronchi were everywhere normal, and the mediastina and their contents were normal. In the head the ventricular system was found to be dilated to three times normal and, except in the left lateral ventricle, was filled with a mixture of clear yellow fluid and "currant jelly" clot. In the left lateral ventricle there was, in addition to the above, a firm mottled bluish tumor mass, the size and shape of a small elongated plum, which was evidently a partly organized blood clot. This was adherent to the lateral posterior wall of the body of the ventricle, and in one point had perforated the cortex into the cerebral subarachnoid space. This clot weighed 30 grams. The original bleeding point was believed to be a rupture of the vena magna galeni within the third ventricle.

The second case was that of a white male baby, born after a fifteen hour labor by a spontaneous face delivery. In the course of the first seven days of life, the frenum of the tongue had been cut and had become slightly septic. On the seventh day the baby became suddenly aphonic, with spells of apnea and cyanosis and evident respiratory difficulty. He was X-rayed in the Children's Hospital, on account of a possible thymic pressure, and following that was intubated on account of a mild pharyngolaryngitis. Neither of these procedures gave relief. Lumbar puncture was then done and was normal in every respect. Nine days after this, having shown slight improvement in the interval, he suddenly had a severe generalized convulsion, with opisthotonus, cyanosis and forced stertorous respiration. Lumbar puncture at this time showed old blood in the cerebrospinal fluid, with a probable partial high bloc. The convulsions continued after an interval, and the baby died twenty-four hours after the last lumbar puncture from respiratory paralysis.

Autopsy showed practically no pathologic condition except in the head. The lungs and trachea were normal. There was a little laryngitis and some moderate pharyngitis but no obstruction. The mediastina and contents were normal. There was in the head a recent large cerebral subarachnoid and basilar hemorrhage. Both lateral ventricles were enlarged three times and contained an organized old hemorrhage, half

filling them and adherent to their walls, with an evident ependymitis.

The last case was that of a white male baby seen with Dr. W. A. Lane. He was born from an O. L. A. position by a normal delivery, without the use of instruments, after a six-hour labor. At the age of forty-eight hours petechiae in the skin and vomiting of old blood was noted. A diagnosis of hemorrhagic disease was made and 25 cc. of whole blood was given subcutaneously. On the fourth day an inspiratory "crow" with sternal bulging developed. He was X-rayed for thymus pressure without relief. The symptoms gradually increased, and on the sixth day a tense bulging anterior fontanelle was noted. Lumbar puncture demonstrated a high intracranial pressure with bloody cerebrospinal fluid. Thirty cc. more blood was given intramuscularly. Nine hours later he became cyanosed, with Cheyne-Stokes respiration, and was using all the accessory muscles of respiration to excess. The fontanelle was very tense, and there was evidently more bleeding taking place within the skull. Thirty cc. of blood was given, but the baby grew gradually weaker and died in four hours of respiratory paralysis.

Autopsy showed practically no pathologic condition except in the head. The larynx, trachea and lungs were normal. There was a marked congestion of the liver. There was a bilateral subdural cerebral hemorrhage. There was an old organized clot 2 cm. in diameter in the right cerebellopontine angle pressing on and deforming the pons and the right cerebellar hemisphere. The ventricles were enlarged three times and were filled with a mixture of "currant jelly" clot and bloody cerebrospinal fluid. The clot was confined to, and practically filled, the entire third ventricle and the right lateral ventricle. The sources of hemorrhage in this case were thought to be a ruptured cerebellar pial vein and a rupture of the vena magna galeni within the cavity of the third ventricle.

#### SUMMARY.

Three cases are reported showing predominant symptoms of airway obstruction.

All were X-rayed in the belief that the obstruction was due to thymic pressure.

One was intubated in the belief that the obstruction was due to an infectious edema of the larynx.

At autopsy the primary fatal lesion in each case was an intracranial hemorrhage.

In two cases the hemorrhage was chiefly confined to the cerebral ventricular system.

In one case the extra- and intraventricular hemorrhage was of equal extent.

15 BAY STATE ROAD.

XLIV.

HEADACHE—MEDICAL ASPECTS.\*

By ROGER I. LEE, M. D.,  
BOSTON.

Headache is always only a symptom and never a diagnosis. Headache is perhaps the most common symptom in the practice of medicine. There is indeed no specialty, so far as I am aware, in which headache is not a symptom. One often suspects that each specialist, from his experience in a limited sphere, sincerely believes that most headaches are caused by disturbances within his specialty. Even the laity speak with complete assurance of eye headache, stomach headache, constipation headache and menstrual headache.

In such a symposium as this it is obviously impossible to analyze critically the whole range of headaches from the point of view of the internist. I have no intention of taking up each organ or each physiologic system that still belongs to the internist and discussing the headaches which may occur with disturbances of that organ or system. It is my intent rather to discuss more generally the significance of this very common symptom.

It has hitherto been the custom in such a discussion to make arbitrary classifications. Headaches would be divided, for example, into frontal, temporal and occipital headaches, and there would be further regional sub-classifications. Then headaches would be divided into continuous, periodic and irregular, with further elaborate subdivisions. Finally, headaches would be again classified into the three famous groups, which have always been the cause of marked annoyance to me, whether applied to headaches or typhoid fever, namely, mild, moderately severe and very severe.

Another favorite classification of headaches concerns the presumable relation of the pathology to the symptom. Thus

\*Presented at the meeting of the Eastern Section of the American Laryngological, Rhinological and Otological Society, Boston, January 24, 1925.

some headaches are supposed to be due to increased cranial pressure or to pressure on nerves, and are therefore classified as mechanical. Other headaches are supposed to be reflex and are perhaps classified as physiologic. Reflex disturbances may be supposed to be mechanical or toxic. Other headaches are supposed to be due to chemical disturbances. As scientific knowledge advances, the old differentiation between physical and chemical processes becomes much less distinct. We now believe that ordinary physiologic processes are associated with rather definite chemical changes. In this discussion all such classifications of headaches will be disregarded.

Of course, each headache has its characteristics and tends generally to have fairly constant associations. The careful history of headaches is, in my opinion, of prime importance and ordinarily decidedly more important than the physical examination. But the history must be the history of the individual patient, rather than a check list of the possible characteristics of headaches.

Obviously most headaches are local manifestations of a systemic disturbance rather than of an immediately underlying pathology. The origin of the systemic disturbance may be practically in any organ of the body. A great deal of confusion has arisen because the same process will not act the same in two individuals and may not always act the same on two occasions in the same individual. The same degree of gastric disturbance may cause a marked headache in one individual and no headache in another. The same is true of constipation. It is well known that there is no particular parallelism between the amount of alcohol consumed and the headache of the morning after. There is, furthermore, no necessary correlation between the amount of intoxication and the amount of headache. The general medical man recognizes that there are individuals who have headaches on very slight provocation. A little cold, a little fever will often produce severe headache. Most individuals have headache with fever, yet one finds a few unusual individuals who are not subject to any form of headache and who can, with a temperature of 102, shake their heads very violently without headaches. Such a procedure would be actually impossible in most of us with that amount of fever.

There is unquestionably a large hereditary factor in the susceptibility to headaches. The hereditary factor is, of course, well established in typical cases of migraine. On the other hand, the profession at large does not seem to appreciate the fact that migraine occurs much more frequently in atypical forms, and that the diagnosis of migraine, and especially atypical migraine, depends on a very careful history and a family history. Perfunctory questions are entirely useless. The age of our patients is ordinarily such that their parents have outgrown migraine, consequently it is often necessary to form the question, "Did your father or mother have periodic sick headaches, even if she or he now has no headaches?" The picture of true migraine is so characteristic that it can be recognized by anyone, but migraine, as I have said before, is much more common in somewhat atypical forms. Furthermore, there are certain types of headaches and a susceptibility to headaches which cannot be forced into the migraine category but which, in the general sense, run in families.

Of course, it is well recognized that a person with migraine or who is susceptible to headaches is very much improved by any improvement in his physical condition. One not infrequently sees rather brilliant results in migraine and other hereditary forms of headache when certain definite defects are corrected, such as the fitting of proper glasses, the control of constipation, removal of diseased tonsils, etc. On the other hand, in the limited sphere of the internist the more common experience is that the individual has been fitted to glasses, has had his tonsils removed, has had his nose corrected, has had his teeth extracted and straightened, all without tangible results. Unfortunately, each procedure is ordinarily hailed as a reasonably certain method of relief of headaches. It is certainly true that many cases of migraine and of other hereditary forms of headache can only be alleviated but ordinarily not cured by the correction of every possible defect, which may include operative procedures on the upper air passages. In such instances, however, the operative procedure is merely part of a general program.

Probably the most difficult type of headache to evaluate is the type of irregular headache, which tends to be persistent

rather than periodic, which may or may not occur on a background of previous headaches or of family headaches. Such headaches are an expression of so-called nervous instability and belong in the realm of psychoneurosis. The actual symptomatology of these headaches is protean. The apparent physical condition of the patient is frequently so excellent that it is very difficult to convince oneself that there is not some very definite organic cause for the headache. Frequently there is clear association of these headaches with the use of the eyes, frequent catarrh, frequent colds, etc. The careful examination and the careful history will usually disclose the fact that, irrespective of the outward appearance of physical vigor, the patient belongs essentially to the group of nervously unstable individuals, and there will usually be a history of nervous instability. One sees these patients wandering from specialist to specialist, getting temporary relief with each new procedure, but frequently the charlatan or near charlatan gets seemingly good results, because in effect he is practicing psychotherapy in his crude and sometimes deluded and sometimes mischievous fashion. We have all had experiences with such patients. We have all seen how the removal of an innocent appendix has stopped these headaches temporarily and has perhaps suggested that the removal of the colon would be more efficacious. If the patients are women, mutilating operations on the pelvic organs are unfortunately frequent. And to come closer to the subject matter of this symposium, repeated operations on the upper air passages are not infrequently an important part of the past history. The development of new postoperative pathologic conditions makes a careful evaluation of the possible local source of headache extremely difficult.

Closely related in many ways to the type of headache just mentioned, which occurs in nervously unstable individuals, is the type of headache which occurs in those individuals who become temporarily unstable through some defect in general hygiene. For want of a better term, such headaches are usually called fatigue headaches. Each individual ordinarily has some indication that life is becoming rather too strenuous and rather too complicated for him. In some individuals the manifestation is a digestive upset, which is popularly known as a gastric neurosis; in some individuals there will be disturbances

of rhythm or other manifestations directed to the circulatory system, and are popularly known as cardiac neurosis; in some individuals there will be backache, others will have dizziness. The most common manifestation is, of course, some form of dull headache, particularly in the back of the head. These disturbances ordinarily mean a lack of balance between work, rest, exercise and recreation. Some of them are to be cured by more sleep, some by more exercise, some by more recreation, some by more breakfast, some by less tobacco, etc. In these headaches any error of hygiene and any defect in any situation may be a contributing cause. As a matter of fact, the headache is frequently the result of the accumulation of many small factors, and one of these factors of varying importance may be a defect in the upper respiratory tract. The purpose of this somewhat long discussion of the individual who is susceptible to headache is to emphasize the importance of history taking and to emphasize, furthermore, the necessity of caution, not only in regard to radical procedures directed to one region, but also in regard to any promises, direct or implied, to the patient or family. It is true that the internist does not get a true perspective. His experience is somewhat warped because he sees not the successful but the unsuccessful cases. Nevertheless, the internist can, I think, testify to an increasing and unfortunate skepticism on the part of the laity concerning the value of operative procedures within the sphere of this society for the relief of headache. There are too many tales among the laity concerning the failure of the specialist to take a history, not to mention a family history.

We must grant, and I think the internist will enthusiastically grant, that many headaches are directly attributed to definite defects, and can usually be alleviated or cured by the appropriate treatment of these defects, wherever they may be found. In the sphere of the internist is the headache of anemia, the headache of nephritis, and also the definite headache related to constipation and pelvic disturbances, but these headaches in the experience of the internist usually have a background of some susceptibility to headache. Most constipated people, for example, do not have headache, and a headache associated with constipation ordinarily means not only constipation but also that the individual belongs to a group of

persons susceptible to headache. Likewise there are the definite headaches due to eyes and due to disturbances of the upper respiratory tract where, when the pathology is corrected, the headache is removed entirely. The difficult problem in the experience of the internist is the occurrence of headache with some local pathology but without apparent outstanding pathology. The internist recognizes, as indeed we all must, that there is no possible correlation between apparent pathology and actual amount of systemic disturbance. Apparently innocent abnormalities often give rise to serious damage. In all cases of headache important evidence can be obtained by careful history and a careful family history. "Do headaches run in the family?" "Does the individual have headache with constipation, slight fever, fatigue or at menstruation?" etc. This procedure is tedious and time consuming, nevertheless experience shows that the addition of a careful history to a reasonably careful physical examination is an essential part of sound medical practice. In any field, and particularly in the complicated field of headache, the removal of actual pathology does not impress the patient favorably if his presenting symptom still persists, particularly if there has been a substantial fee attached to this removal. On the other hand, the reasonable patient, if he understands that the removal of actual pathology is done without any promise, after a deliberate evaluation of the factors, will be satisfied. I do not believe that it is necessary or desirable that every patient with headache with pathology in the upper respiratory tract should be referred for a complicated examination by an internist or to an expert in psychoneurosis. I do believe, however, that as a part of his necessary equipment the expert should furnish the patient with a competent opinion concerning these factors. I believe that the specialist is or should be competent to evaluate in a general way these factors, certainly in so far as making the decision as to whether the patient needs special treatment. In my opinion, it is largely a question of consideration of these aspects and the consumption of a certain amount of time for the development of data on the lines I have indicated. I believe, furthermore, that possible operative procedures would have their indications often sharply defined by a careful scrutiny of the patient and of his background. The brilliant results

of the sphere of this society would be much less dimmed by unfortunate results if the patient as well as the local pathology should be studied.

In conclusion, I want to emphasize again that headache is only a symptom and that each individual has a varying susceptibility to that particular symptom and that this variation runs the entire length of the scale.

XLV.

HEADACHES (NEUROLOGIC ASPECTS)—THE SIGNIFICANCE OF PRESSURE IN THE CAUSATION OF HEADACHE.\*

BY JAMES B. AYER, M. D.,

BOSTON.

Headaches seen by me at the Massachusetts General Hospital, neurologic clinic and in private practice fall about equally into three groups:

1. Cranial neuralgias.
2. Headache associated with obvious increase in intracranial pressure.
3. Miscellaneous group.

1. Cranial Neuralgias.—By far the largest number of these cases are in the trigeminal field, due to pathology in the teeth and sinuses, and the obscure tic douloureux; a goodly number of neuralgias of the lesser and greater occipital nerves also, due to postural defect, to weak musculature and to cervical arthritis, also an occasional patient has cervical root or plexus symptoms referable to glands, tumors outside or inside of the vertebral column and disease of the vertebrae themselves, and again from arthritic changes.

These cases are usually differentiated readily from intracranial headache by their nerve distribution, by the type of pain and by tenderness, although there are numerous cases in which extracranial neuralgia is confounded, at least for a time, with a true intracranial headache. I will leave this group for later readers, more able to speak on them than myself, and proceed to the intracranial headaches.

Before speaking of the next group, it will be well to mention a few well known or probable facts: It is probable that the brain itself is insensitive to pain. It is well known that the

\*Presented at the meeting of the Eastern Section of the American Laryngological, Rhinological and Otological Society, Boston, January 24, 1925.

dura is sensitive to stretching and pulling, and it is quite certain that the principal nerve supply of the dura is from the fifth nerve. It is apparent that from within the skull the dura may be excessively pressed upon by increasing either (1) the brain bulk, or (2) the amount or pressure of intracranial blood, either arterial or venous, or (3) the pressure or bulk of intracranial cerebrospinal fluid. If sufficient pressure be exerted by one or more of these agents, it is reasonable that sensory symptoms which we call headache will result. It is also possible that a change may occur in the dural nerves analogous to neuritic changes elsewhere, but so far as I am aware, these have not been demonstrated.

Group 2.—Many examples of obvious increase in intracranial pressure come to the neurologist. Perhaps the most satisfactory way of demonstrating pressure is by manometric readings of the cerebrospinal fluid. In this group a pressure reading of less than 300 mm. (aqueous) is seldom found, except during periods when headache is absent. (Two hundred and fifty mm. is high normal). X-ray evidence of increased intracranial pressure and in babies elevation of the fontanelle and separation of the sutures are also reliable objective findings.

The various forms of meningeal reaction account for the greatest number of cases seen by me, including true bacterial meningitis, aseptic meningitis, serous meningitis and syphilitic meningitis. All of these give bilateral and generalized headache.

Intracranial tumors and arachnoid cysts come next in frequency. There is a certain value in the location of the headache of tumors, although the headache is always said to be deep. A cerebellar tumor is likely to exert its pressure and its symptoms primarily upon the dura surrounding the cerebellar fossa, but when, through increase in growth, obstruction to the Sylvian aqueduct has been caused, the headache resulting from a uniform dilatation of the third and lateral ventricles becomes generalized throughout the cranium. A tumor of one cerebral hemisphere usually causes greater headache on the side on which it is situated, the falx serving to protect to a certain extent the normal side. Pituitary tumors cause headache deep in the center of the brain and of expan-

sile character. Of course, there is a stage at which brain tumors cause no headache at all or only periodically; and slow growing tumors, through fluid and blood adjustment, may reach a very considerable size without headache or signs of increased intracranial pressure, as shown by X-ray, choked discs or spinal fluid pressure estimation.

Abscess, in my experience, not infrequently exists, above or below tentorium, with little accompanying headache, presumably because of replacement of brain tissue rather than displacement with pressure.

Hemorrhage into the brain, and especially hemorrhage into the meninges, causes, evidently from sudden distention, excruciating pain in the head, simulating closely the headache of acute meningitis. The same is true of many cases of head trauma with cerebral laceration or contusion. The deep seated cerebral hemorrhage gives no localizing signs, and the suddenness of the meningeal hemorrhages causes such excess of pain that again localization is frequently wanting.

Group 3.—The third group is of especial interest because the causes of the headache are so various, some being extracranial, some intracranial and some of doubtful origin. Also because the mechanism of the symptom headache is less obvious.

This group comprises such divergent conditions as fatigue states, arteriosclerosis, concussion of the brain, traumatic neurosis, polycythemia, uremia, eyestrain, constipation, migraine and the headache which follows lumbar puncture.

In that increase in intracranial pressure obviously explains in a satisfactory manner the conditions grouped previously, it will be of interest to analyze these conditions in Group 3 with reference to what we know concerning intracranial pressure. Two of this group, polycythemia and uremia, regularly show high pressure, as indicated by the spinal fluid manometer, and with the withdrawal of fluid in the case of the uremic are consistently followed by a clearing in headache and mentality, sufficient evidence that pressure alone plays an important part in the symptom headache. Moreover, in uremia at least, and also in constipation headache, and in the headache which follows an acute alcoholic debauch, we can obtain prompt though not necessarily lasting benefit to the headache by the use of a

saline purge. From our present knowledge of the action of hypertonic salt solutions on the cerebrospinal fluid, we know that a drop in fluid pressure begins in ten to fifteen minutes after intravenous administration and a little later when taken by mouth. We know that strong saline solutions tend to deplete not only the cerebrospinal fluid spaces but the fluid contained in the brain itself. In conditions such as the alcoholic or uremic "wet brain," it is reasonable to attribute the improvement from saline purges, which begins twenty to thirty minutes after administration, to reduction in cerebrospinal fluid pressure.

In the case of headache following lumbar puncture and that occurring in the asthenic and anemic, quite a different situation exists. Neither condition presents evidence that the brain or dura are under high tension; on the contrary, I have frequently observed that the spinal fluid pressure is much lower on second lumbar puncture in cases presenting headache from an earlier puncture. In these cases Solomon has shown that pituitrin rapidly restores pressure with coincident improvement in headache. What is the mechanism of the headache when the brain appears to be under low tension? If we may assume that the cerebrospinal fluid is actually less than normal in amount, an assumption not proved but probable, then we may reason that there is an excess of blood in the cranium, for the fluid and blood are the only mobile substances present. As there is no evidence that arterial blood is increased, it is probable that the venous system is overfilled, and the large dural sinuses would naturally be important reservoirs of venous engorgement. Along with other symptoms, such as nausea and vertigo, the constant localization of headache is over the occiput, which can reasonably be explained on the basis of distended lateral sinuses and torcula. That the headache occurs almost exclusively in the upright position again emphasizes a lack of balance between intracranial fluid and blood pressures.

Certain other headaches may readily be explained on the basis of cerebral venous congestion, as the headache of some cardiac decompensations. Dr. Cobb has told me of a patient with persistent headache in which he brought about a cure by simply substituting a soft collar for a high "choker," a

pathologic demonstration of the prolonged effect of compression of the jugular veins.

Can the headache of cerebral arteriosclerosis be explained upon a simple pressure basis? In cerebral arteriosclerosis it is common to find a high normal or slightly elevated spinal fluid pressure, usually ranging between 200 and 250 mm. It has been shown that cases presenting cerebral arterial hypertension, as judged by a special test designed to estimate the tension in the retinal arteries, showed an increase in spinal fluid pressure. It may be argued that the dura in such cases is under a constant, slightly increased tension, and is therefore more sensitive to further pressure insult, as is the case when a patient sneezes, coughs, stoops or carries out any of the acts which we know will suddenly produce further increase in intracranial pressure. It would seem as if normally the dura were capable of "taking up the slack" of impulses which tended to expand it, but that under increased tension painful sensations were produced.

There still remain headaches which cannot be explained on simple cerebral congestion bases, the so-called "neurasthenic headache," and especially migraine. It has been maintained for years that migraine and migrainoid types of headache were due to spasm of cerebral vessels from a disordered vasomotor system. It is certainly difficult to explain a hemicrania on any other basis, and with accumulating physiological evidence of the presence of vasomotor nerves within the cranium this explanation of a common and refractory type of headache is reasonable.

We may summarize by suggesting that the majority of headaches, leaving out of consideration the cranial neuralgias, may reasonably be explained upon a pressure basis, either permanent or periodic; that the pressure exerted may be due to increase in intracranial tissue, as in tumor of the brain, to arterial hypertension or venous congestion, or to excessive amount of pressure of the cerebrospinal fluid. There still remains a small number of cases in which we must admit, in part at least, a cerebral vasomotor nerve derangement in explanation. We must also admit the possibility of reflex and toxic influences in a small number of cases. But the emphasis, I am sure, is to be laid upon abnormalities of pressure within the cranium.

XLVI.

HEADACHES AND CRANIAL NEURALGIAS—ENDOCRINE ASPECTS.\*

BY CHARLES H. LAWRENCE, M. D.,  
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The material on which this paper is based consists of the records of 435 consecutive patients, whose endocrine functions were tested at the Evans Memorial Hospital. They were sent for these tests because the usual medical examinations had failed to reveal any logical cause for their symptoms, and had definitely suggested deranged endocrine function.

The tests employed are those described by Rowe.<sup>1</sup> In conjunction with these laboratory tests of general and special metabolism, a complete history is obtained, and a general physical examination is performed, to which are added such special examinations as seem necessary to eliminate organic nonendocrine disease from the picture.

Of the 435 patients thus examined, 310 gave sufficient evidence of deranged metabolic activity to justify the diagnosis of probable endocrine malfunction, while 125 showed no evidence of disturbed metabolism.

The incidence of headache as the chief complaint or prominent symptom is not extremely different in these two groups. It occurred in 11.9 per cent of the endocrine and in 8 per cent of the nonendocrine group. So far as one can judge from these series, therefore, endocrine malfunction is not one of the chief causes of headache; or to put it from the patient's point of view, headache is not particularly indicative of deranged endocrine function.

This conclusion applies to disturbed endocrine function as a whole, but a closer analysis of the group brings to light some interesting findings in regard to special endocrine disorders. Sixteen per cent of the patients with thyroid dis-

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order had headache of the migrainous type. One group of these patients did not present the clinical picture of myxedema, and in most of them the thyroid failure had been completely overlooked. The clinical picture of this condition can best be illustrated by a brief description of such a patient.

Case 273.—Miss R., age 41, first consulted me in 1918 in search of relief from severe headache which she stated she "had always had." Two sisters have similar headaches. They began almost always at night, accompanied by nausea and chilly sensations. The pain, which was severe enough to keep the patient in bed, usually began in the occipital region, gradually spread until it involved the entire head, and after twenty-four or thirty-six hours began to disappear in the reverse direction, that in the occipital region remaining longest. During the attack the patient could retain nothing but water in the stomach. The attacks at first occurred every three or four weeks, usually about the time of the catamenia, but had recently become more frequent, occurring every two weeks. Between attacks there was no headache, but the patient felt very tired much of the time. There were no other symptoms. The catamenia was normal.

Physical examination, beyond showing a patient who looked weary and was painfully thin, gave no information. The skin was sallow but not otherwise abnormal. No organic pathology was found. The usual laboratory examinations were negative. A refractive error had been corrected without influencing the headaches.

On the basis of the negative examination, the character of the headache, and the history of occurrence of similar attacks in other members of the family, a diagnosis of migraine seemed justified, and palliative treatment was recommended. During the next five years the headache continued. The tonsils were removed without benefit. Neurologic examination and exhaustive examination of the digestive tract did not help. Pelvic examination revealed no cause for headache. Renal function was normal. The diagnosis seemed confirmed.

In March, 1923, the patient was persuaded to enter the Evans Memorial for an investigation of her general and special metabolism. It was then found that her basal meta-

bolic rate was —30 per cent, her sugar tolerance normal, and her blood chemistry suggestive of a mild chronic nephritis. The eyegrounds and Barany test were normal.

On the basis of these findings a diagnosis of hypothyroidism was made and thyroid extract was given. Since then the patient has had only two headaches—one following a period of mental and physical overactivity, and the other coming on after thyroid extract had been discontinued during a period of six weeks. She has gained twelve pounds, and the chemical examination of the blood now gives normal findings. One of her sisters has also been examined. She likewise had a low basal metabolic rate (—20 per cent) and has been relieved by thyroid medication. The other sister I have not seen.

To date we have examined in the clinic at the Evans Memorial 32 patients whose symptoms and laboratory findings were very similar to those just described. Roughly, 30 per cent of them had headache of the type usually described as migrainous. The majority were women, there being only two men in the series. In several instances there was a story of similar headache in several members of a family.

From a study of this material certain conclusions may be reached, and certain interesting questions arise which demand further study. That thyroid failure, not associated with demonstrable myxedema may cause headache of the migrainous type seems certain. Just how it does this is less certain, but a study of the nitrogen in the blood suggests that nitrogen retention due to the thyroid failure may be the direct cause of the headache. Whether the tendency of thyroid failure to occur in several members of a family (Janney<sup>2</sup>) explains in part the tendency of migraine to do the same thing, is a question yet to be answered. At present it can only be said that the fact that several members of the family have similar headaches is no evidence against a possible endocrine etiology.

Disease of the pituitary gland, in our series of cases, was associated with headache with the same frequency as thyroid failure. The pain may be due to tumor of the gland or to disturbance of its function. The former condition is neurologic in its aspect and lies outside the province of this paper.

In our experience headache associated with deranged pituitary function generally differs markedly in character from that due to thyroid failure. It is almost always temporal or frontal, often extends up to the vertex, but rarely involves the entire head. It is usually described as a dull throbbing ache, and in about half our cases has been associated with slight vertigo. It suggests disease of the nasal accessory sinuse much more than migraine, and careful examination of those structures is demanded in the differential diagnosis of headache due to pituitary dysfunction.

The important points in such a diagnosis are, first, absence of organic cause for the headache; second, evidence of excessive height or weight, past or present; third, examination of the retinae and plotting the visual fields; and fourth, determination of the basal metabolism and sugar tolerance.

The treatment of these headaches depends, of course, upon the character of the functional derangement present. The commonest type is hypofunction of the anterior lobe, combined with hyperfunction of the posterior. (Cushing<sup>3</sup>.) In many of these cases the use of anterior lobe extract, in large doses, by mouth, controls the headache. Hyperfunction of both lobes is rare, but in three cases recently seen in our clinic irradiation of the pituitary has controlled the headache. Bilobar hypofunction is likewise rare, but in our limited experience responds fairly well to extract of the whole gland given by mouth, though the amount required to produce results is far larger than that usually employed.

From time immemorial the ovaries have been held responsible for many feminine ills, including headache. Our experience with surgical castrates and patients having definite evidence of ovarian hypofunction does not lend much support to such a theory. The fact that headache occurs at the time of the period is not proof that deranged ovarian secretion causes it. In the case cited above, for example, the headaches, due to thyroid hypofunction, occurred most commonly at or near the menstrual period. Headaches due to intestinal stasis, focal infection or other organic causes not infrequently show the same cyclic intensification. There is, apparently, an increased irritability of the nervous system coincident with menstrua-

tion, which is, in certain patients, a contributing, but not a causal, factor in the production of headache accompanying catamenia.

An analysis of our material shows only 10 per cent of patients with ovarian hypofunction who complained of headache, as compared with 8 per cent of the group showing no evidence of any endocrine disorder.

In those cases in which headache was associated with evidence of ovarian hypofunction, and in which the use of some ovarian extract brought relief, there was nothing typical about the headache, but the menstrual history did show certain characteristics. Practically all these patients matured late, though bodily growth was normal. In practically all the menstrual period was of short duration, and frequently interrupted by periods of amenorrhea, which lasted from six months to a year. There was usually no pelvic pain with menstruation, unless there was mechanical cause for it, demonstrable by pelvic examination. Menstrual pain, in our experience, is far more often due to anatomic than to functional abnormality.

The tentative conclusions to be drawn from our study of the endocrine function of the ovary are that its derangement is not responsible for headache and pelvic pain nearly so often as is generally supposed; that there is no particular kind of headache which is diagnostic of deranged ovarian function, but that delayed maturity and scanty menstruation without mechanical cause or growth abnormality is suggestive of, but not diagnostic of, ovarian hypoactivity.

Concerning the relation of headache to other endocrine and alleged endocrine activity there is at present no convincing evidence. Indeed, with the exception of the thyroid and pituitary glands, the evidence that deranged endocrine function causes headache leaves much to be desired. At present it can be stated that thyroid failure or deranged pituitary function is responsible for a small fraction of headaches. That fraction is important, because it comprises those cases in which the usual examinations fail to discover the cause of the symptom. In such cases the possibility of deranged metabolism, due to endocrine malfunction, should be considered before the diagnosis of migraine is accepted. The possibility of an endo-

crine disorder is not justification for experimenting with various endocrine preparations. It does justify, however, a careful examination of the patient's general and special metabolism by means of various tests of endocrine activity.

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## XLVII.

### HEADACHES AND REFERRED PAINS—DENTAL ASPECTS.\*

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The peripheral irritations are of vital concern to the dentist, inasmuch as he is expected to give immediate relief for pain. To do this he must make an orderly and correct diagnosis and proceed by a careful process of elimination of several factors in his study of the etiology.

In embryonic and fetal life nerves in development and growth are never encroached upon by other tissues; this is also true in the normal growth after birth. A variation of this is seen in a pathologic condition of the jawbone (as sclerosis) or excessive calcification, wherein the normal spongiosum gives place to a dense ivorylike structure encasing the peripheral nerves and thereby lessening their function.

There is an elastic toughness to the nonmedullated nerve fibers of the tooth pulp. The apical end may spring back and ball up after extraction of a tooth, leaving a mass of nerve tissue which may become involved in bone reconstruction and excessive bone density, a condition more common than is supposed. Unfortunately, an X-ray film will not disclose this.

Loss of teeth, one after another, in futile effort to find cause of pain, only induces more pain or lays foundation for it.

A constitutional tendency to overcalcification in different parts of the body may result in pulp stone formations within the teeth or the mandibular canal.

A distinction should be made between odontalgia and neuralgia, although a combination of the two may be active at the same time. Meyers says that pain is a beneficent reaction through the nervous system; an indication of an altered structure or disordered function—a species of warning that the

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function of a nerve has been disturbed. Pain is the overexcitation of sensory nerves. Odontalgia is a form of pain referred by the patient to a particular and definite tooth or teeth. Neuralgia is defined as pain referred to some area or point away from and other than its origin. Pain referred to a distribution of a sensory nerve may be the result of overexcitation of any portion of the nerve in its terminal distribution. This may be induced through disease affecting the trunk or its site or origin, or the irritation of one sensory nerve may readily excite another. The periodontal membrane is the touch organ or sensory point of the tooth. Odontalgia is usually of an intermittent form and, in consequence, is associated with neuralgia and assumes the character of neuralgia in its manifestation. It must be remembered that, as with other disturbances in the body, an acute disease, if left untreated, tends to become chronic, so, too, a persistent odontalgia, as a result of a variety of irritations, to be classified later, may degenerate into the chronic neuralgic type of pain which is referred to areas other than the teeth.

The following outline covers the main conditions which usually give rise to odontalgia:

#### I. Pulp affections.

1. Injuries and disease of the pulp, as exposure by fracture of the tooth.
2. Varying degrees of inflammation, caused by attrition, erosion, caries, which lead to:
  - (a) Exposure of pulp through loss of the tooth structure.
  - (b) Pulp stones and other calcific degenerations.
  - (c) Suppuration without exposure.

#### II. Injuries and diseases of the periodontal membrane.

1. Periodontitis, due to direct injury.
2. Periodontitis, due to septic extension from pulp, causing apical abscess.
3. Alveolar abscess—necrosis of root.
4. Periodontitis resulting in hyperplasia of the cementum with absorption, or both conditions combined.
5. Pain from direct exposure of the cementum.
6. Periosteal or subperiosteal inflammation of the jaw.

7. Overtraumatization of the process and bone of the jaws—i. e., excessive use of the chisel and mallet or forceps; overtraumatization of the periosteum with subsequent repair and local calcification.

Neuralgias may have their origin in all of the above, odontalgias, and, in addition, the following:

A. General systemic diseases, as gout, rheumatism—i. e., arthritis in all forms, syphilis, anemia, influenza and pregnancy.

B. Difficult eruption and malposition of teeth, particularly unerupted lower third molars.

C. Odontomes, tumors, cysts, overcalcification of bone, particularly mandible, and the tuberosity of Grey. Tumors within the maxillary antrum associated with teeth.

D. Edentulous mouths, with peripheral nerve filaments in osseous deposits.

E. Engorgement of the sinuses, due to coryza and pressure on the maxillary division of the trigeminal nerve.

F. Intracranial lesions or tumors yield bilateral pains, resulting in epileptiform neuralgias.

G. Chronic toxic areas, as blind abscesses, single or multiple; also areas of sclerosis or calcification, with pressure on nerve trunk or periphery of nerves.

H. Mixed types of pain.

(a) Electrical, as dissimilar metal in teeth without intervening insulation, as cement lining; galvanic shocks, where gold and silver are adjacent and in occasional contact.

(b) Chemical, as acidosis or burns.

(c) Mechanical, as marked malposition of mandibular condyle, giving rise to referred pain within the ear, or temporoauricular; coincident with excessive loss of teeth and a collapsed articulation.

I. Surgical, exploratory in region of sphenoid, giving rise to sphenopalatine neuralgia.

Peripheral nerve degeneration may be induced through faulty mechanical appliances worn over a long period and unrelieved.

Headache pains which are common and familiar may be induced through a toxic distribution, often from abscessed

teeth or adjacent areas, these acting upon the dural distribution of the fifth nerve, giving rise to a vasomotor engorgement.

Pains of inflammation:

First—General soreness or lameness.

Second—Throbbing, due to overdistension of vessel and capillaries.

Third—Vasomotor reflexes which alternately induce contraction and dilation of vessel walls, which further tends to inhibit a normal functioning of the part.

Fourth—Impulses from inflammation pains may be carried to adjacent nerve plexuses.

In general, the fifth nerve and its branches appear to be more commonly involved in irritation from external sources than the adjacent nerves; and when the causative factors remain untreated over a long period of time, it may degenerate into an involvement of the Gasserian ganglion itself.

PRACTICAL QUESTIONS AND ANSWERS.

Why is it there is pain after extracting teeth, even to the third and fifth day? Bone and periosteal injury—i. e., osteitis and periostitis, where toxic products produce inflammation; these become sources of irritation to the peripheral nerves, and, in addition to pain, sometimes results in neuralgia.

If we have a dental and other infection, which should be treated first? Under other infections we may include nasal stenosis, empyema antri, tonsils, or glands of the neck, which may be enlarged or suppurative; infections of the tear sac, infections of the eye or ear. We should advise cleaning up all foci of infection involving teeth, maxilla, or mandible as a preliminary, and only on rare occasions combine the two operations.

Is there any danger from removing many infected teeth at once? The danger depends upon the condition of the patient, the number and pathologic condition of the teeth to be removed. For example, when a patient has a temperature well above normal, known to be due to renal abscess or nephritis, care should be exercised in extraction and curettage postponed if possible. When an acute abscess is formed with a localized cellulitis in the soft tissues, extreme care should be given

when lancing the abscess to evacuate pus, in order to avoid penetrating the walled off part, which would lead into the general circulation. Unless this precaution is observed there may ensue an exacerbation of the major disturbance and possibly a septicemia.

Is an apical abscess not shown in X-ray film capable of giving rise to systemic absorption? Familiarity with the regions X-rayed—i. e., bone thickness through which X-ray must penetrate and interpretation of minute structural changes in bone—will be of a great assistance in reading the film, even though we may fail to locate area of foci.

Do certain germ have a selective affinity, making them more likely to cause apical abscesses? Any pyogenic bacteria infecting a tooth pulp and confined under a filling or gold crown may give rise to an apical abscess; the incidence of stress upon the tooth through faulty apposition with its opponent is a considerable factor in the apparent frequency with which teeth appear to be prone to abscess formation at the apex. This selective affinity in this event is influenced by mechanical stress rather than by a special bacteria. Of more importance is the question of the diffusibility of the toxins from these teeth, and the variation in the toxic distribution will be governed by the type of pus forming bacteria associated with the abscess. The *staphylococcus pyogenes aureus* is very common in teeth infection; in pure culture the diffusibility is low. Whenever a mixed variety is present the diffusibility increases, as with the combined *staphylococcus* and *streptococcus viridans*. Localized hemolysis, where the infection is involved with the *streptococcus hemolyticus*, is more active in producing secondary manifestations of referred pain, engorgements of the antrum, or iritis. It is interesting to observe that a patient with many broken carious teeth, buried roots below the gums, loose pyorrhitic teeth, and multiple apical abscesses will often be free from pain, local symptoms or referred disturbances of any kind. And another patient, with a clean mouth and teeth in good condition, with the exception of one tooth, showing by X-ray film a rarefied area of absorption of bone at its apex, will suffer from headache, recurrent iritis or a definite referred neuralgic pain. We believe the difference in the reactions by comparison is largely due to

the type of bacteria and the free vent of the toxic products into the oral cavity in the first case; and in the second case, the confined bacteria, within highly resistent tissues, and the type of bacteria, such as the streptococcus viridans or hemolyticus, would give rise to such severe symptoms and reactions.

Why it is certain teeth, if dead, appear to yield to dental efforts at filling and do not require extraction, whilst others become abscessed and require early extraction? A tooth is not wholly devitalized or dead simply because the pulp has been removed. The bulk of the tooth within its membranous socket is still vital, and where the technic of root canal treatment is good and clean, and the patient's health is good, there is always a better chance for the salvation of the tooth.

Is the vitality test of teeth reliable? Only in conjunction with a careful estimate of the relative vitality of other teeth. It is not fair to test teeth too soon after an operation in the nasal fossa or in the antrum, for it takes time for the circulation and tissue cells to recover and readjust to approximate the normal; under such circumstances many teeth are being pronounced dead by the vitality test that should have been left unopened and untreated until at least several months after the operation before the tests are made. Transillumination of teeth and adjacent bone, as a means of diagnosis for vitality or pathology, is only an aid and seldom to be wholly relied upon. In making electrical tests of vitality, care should be exercised not to touch any metal fillings. Teeth under normal conditions may indicate a low vital response to the test. This does not indicate definite pathology.

Why is it difficult to demonstrate apical abscess on upper molars in their relation to the antrum? The variations in the densities of the bone on the facial aspect and the frequent mounding of the tooth roots into the antral mucosa; the rapid diffusion and distribution of the toxins into the lymphatic circulation, or even a fistula into the floor of the antrum, makes it difficult and sometimes impossible to demonstrate the real status with an X-ray film or plate. Yet such teeth or latent infection in the antral floor may be the basic cause of headache or referred neuralgic pain.

## XLVIII.

### HEADACHE—OPHTHALMOLOGIC ASPECTS.\*

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Next to defects of vision, headache is probably the commonest symptom with which the ophthalmologist has to deal. Fifty per cent of eye patients have headaches as one of their symptoms, often the most important one. Some statistics give 70 per cent as a more correct figure. Of course, the figures vary with the class of practice investigated, but there is no question that the number is very large.

It follows that any ophthalmologist has a large experience on which to base a knowledge of headache from a clinical point of view. It does not follow that we know much about it. Only those morbid conditions in which the problems supplied by the clinician are subjected to scientific analysis and study by laboratory methods get to be really understood. And in the case of headaches even the most powerful searchlights of the laboratory only serve to make the surrounding darkness more visible than ever, by contrast. Headache, for obvious reasons, has not been studied by analytical laboratory methods, so that we must content ourselves with superficial conclusions.

From the ophthalmologist's point of view, headaches may be divided into two groups, first, those in which an ocular condition is the cause of the headache. Such are eyestrain, glaucoma, iritis and other inflammatory conditions. Second, those in which the cause is not ocular, but something about the eyes betrays the nature of the true cause of the headache. Thus papilledema, optic neuritis, retinitis, hemorrhage, arteriosclerosis of retinal vessels, diplopia, defects of the field of vision, etc., often throw light on some underlying condition of which headache is a symptom.

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I shall not weary you with an attempt to discuss all of them in detail. For example, local inflammatory conditions often cause pain which extends beyond the eyeball and covers one-quarter to one-half of the head. It is usually easy to recognize that the eye is at fault. Glaucoma is more important, because more often overlooked. It is just rare enough so that the average man is not on the lookout for it, and in chronic form is so insidious that even the experienced ophthalmologist too often fails to detect it. Some of these chronic cases of glaucoma have headaches which the patient does not associate in any way with his eyes. There may be some arteriosclerosis, and the physician is satisfied to attribute the headache to this as an adequate cause. And why shouldn't he? Do we expect him to send every case of headache to an oculist? No, I do not believe that is necessary. But I do believe that every obstinate case of headache, every case not relieved by the treatment adopted, should be given a thorough ophthalmic examination, and I wish to emphasize this. Fortunately, this necessity of a complete study of the eyes is now recognized so generally that the practitioner who neglects it in a stubborn case of headache is likely to find himself in a very awkward position, particularly if the patient is advised by someone else to consult an oculist and thereby obtains tardy relief.

By far the most important cause of habitual headache is eyestrain. What do we mean by eyestrain and how does it cause headache?

The term "eyestrain" is a very useful one, but we should have as clear an idea as possible of what we are straining. It is the adjusting mechanisms of the eye that are strained. It is not the retina or the perceiving or sensory parts of the eye that are strained in "eyestrain." Fatigue of a nerve of special sense, such as the nerve of the retina, does not produce pain; it produces diminished or altered vision. This may excite the eye to renewed efforts to improve vision by straining the adjusting mechanism and so produce eyestrain, but the strain is not of the sensory mechanism.

The adjusting mechanisms which may be strained are two. First, the focusing mechanism, which secures a clear image on the retina, and second, the fixation mechanism, which fixes the eyes on the object to be looked at.

If the focus of the eye varies by so much as the hundredth of an inch from the plane of the retina, then the image is not good and something must be done to improve it, if possible.

If the two eyes are not so turned by the external ocular muscles toward the point to be looked at—the fixation point—that the image of that point falls accurately on the macula of each eye simultaneously, there is failure of binocular single vision with very distressing results.

There would be no such satisfactory vision as we have if nature had not provided suitable mechanisms for doing these two things, viz., securing an exact focus of the image on the retina and an exact coordination of the ocular movements.

Moreover, it is by means of these two mechanisms that one is able, on the one hand, to correct many of the commonest errors of refraction and secure, in spite of these errors, a good image on the retina, and on the other hand to correct palpable defects of ocular muscle balance and secure binocular single vision. The mechanism for focusing includes the lens with its elastic support, the ciliary muscles to regulate the tension of this elastic support and so regulate the curvature of the surface of the lens, the nerve supplying the ciliary muscle, its primary center below the third ventricle, and the adjoining and interconnected groups of motor nerve cells and their nerves and muscles which are associated in the act of accommodation.

The mechanism for fixation and binocular vision includes the muscles moving the eyes or associated with them and their motor nerves, and especially the motor nerve cells below the third and fourth ventricles, with their elaborate system of intercommunication and coordination, not only with each other, but with the visual centers, auditory and other centers often concerned in ocular movements.

What I wish to emphasize is that it is not merely muscles that are subject to fatigue. It is in the elaborate, intricate system for coordinating these muscles that we should look for the seat of trouble. For example, it is the rarest of exceptions that an exophoria is due to a weakness of one or both internal rectus muscles, as is so commonly thought. On the contrary, these muscles are usually amply strong. The trouble is in the way they are managed by the motor nerve cells or centers.

Right here I wish to call attention to the ability of the eyes to maintain these mechanisms in active operation for hours at a time. The ordinary average individual can read or work at such a distance that focusing is necessary for clear seeing, and can keep up coordinated movements of the two eyes—e. g., back and forth across a page, and do these two things, focus and fixate, for hours at a time with no distress at all. The muscular work done is extremely small. The strength of the individual muscles is far beyond the maximum pull required of them. With the aid of Prof. Kennelly, I made some calculations and found that the external ocular muscles were built to pull over 100 times the load ever required in ordinary eye movements.

I call attention to this to show why eyestrain is not universal. Unfortunately, some enthusiasts would have the public believe that 90 per cent need glasses to save them from dire results, and they are pushing active propaganda to make the public "eye conscious." At the other extreme are Bates and his followers, who would have us believe that no one needs glasses.

I wish to point out next the difference between the demands on the adjusting mechanisms made by ordinary hard use of the above kind, which produces no symptoms of eyestrain, and the demands on the adjusting mechanism which do produce eyestrain.

The difference is essentially a difference of degree. The ordinary use of the eyes for hours does not produce strain when the work is well within the limits of endurance of the mechanisms. Under two conditions the limit is reached more early and strain follows. First, when the mechanisms, one or both, have to contend with some handicap. For example, (a) there is an error of refraction, the correction of which has to be managed by the focusing mechanism in addition to the ordinary focusing for the distance of the work. This error may be of such a character that it puts a strain on the mechanism because of its magnitude or because it demands more exact and trying adjustment. (b) The print may be poor or the lighting defective or the object unsteady. Such conditions as these make seeing poorer, and to make up for this the eyes are whipped up to a more perfect adjustment, resulting in strain.

For under good ordinary conditions—e. g., of reading, the eyes do not exert themselves to their best adjustments. We skip along a line, stopping here and there to fix a word, neither focusing nor fixing with great care, because it is not needed. It is the same with any other complicated coordinated set of movements—e. g., playing a piano. If the demands of the occasion are far within the player's capacity he does it without fatigue. If the piece is more difficult, the audience more exacting, etc., then he is keyed up to a far more intense effort of coordination, and so greater fatigue follows.

There is another group of conditions which may be responsible for the work becoming too much for the adjusting mechanism to bear and so resulting in eyestrain. These are any conditions which reduce the endurance of the neuromuscular mechanisms. They include all debilitating general conditions from diseases of various kinds to overwork or lack of food or sleep.

In a large percentage of cases more than one factor is at work. This is perhaps the most important fact I have mentioned. To an error of refraction may be added overwork or lack of sleep or of needed out of door exercise; or the work may have been changed to a more trying type of work or of environment.

Hence there are three ways of treating eyestrain, which may be successful singly or in combination:

- (a) Stop or reduce work.
- (b) Build up general endurance.
- (c) Have suitable treatment by the oculist to make the work of the adjusting mechanisms easier. This is most often the prescribing of glasses but may be operation or other treatment.

Is there any way to recognize in a given case whether a headache is ocular or not? I think not. Ocular headaches are most often frontal, but very frequently are felt in other parts of the head or neck, and there is probably no location which has not occasionally been the seat of discomfort from eyestrain.

The character of the pain is no more pathognomonic. It may be constant or periodic, with longer or shorter, regular or irregular intervals. If regular, it is usually because of the

regularity of some contributing factor—e. g., Sunday headache or monthly headache.

The most valuable guide is the history. Ocular headaches usually but not always show on careful investigation some connection with use of the eyes, often not recognized by the patient, however, so that mere questioning the patient, "Is it made worse by use of the eyes?" is far from conclusive. With the individual history must be included the family history, for the typical eye headache is rarely an isolated phenomenon in a family of any size.

As between headaches from strain of the focusing mechanism (refraction headaches) and those due to the adjusting mechanism (due to ocular muscles in the common, misleading terminology), the symptoms are not at all conclusive. From focusing strain the pain is more often frontal; from fixation strain, often occipital or cervical.

A few words about headaches not of ocular origin.

Among the ocular conditions which are enlightening in such cases we may consider papilledema, optic neuritis, visual fields, retinal changes, including hemorrhages and vascular changes, diplopia.

Papilledema is edema of the optic nervehead due to mechanical damming back into the eye of that fluid which finds its normal exit from the eye by way of the optic nerve. The subdural space of the optic nerve is continuous with the subdural space of the brain. Hence any increase in the pressure of the cerebrospinal fluid may show itself in edema of the optic nerve head. This is a very valuable sign, though perhaps less so than before the days of spinal puncture.

I wish to call attention to a neglected discovery of Dr. W. R. Parker's. He found that when the swelling of the nerve was greater in one eye than in the other, it was because the intraocular pressure was lower in that eye. Much has been written about the significance of a difference in the swelling of the two eyes. Attempts have been made to show that the eye of the greater swelling is on the side of the cerebral lesion. There is no room for doubt that the most important factor is the difference in intraocular pressure: the less the intraocular pressure, the more easily the cerebrospinal fluid will be dammed back into the nervehead of that eye.

Papilledema is a noninflammatory edema. Optic neuritis differs from papilledema in being a true inflammation, not a mere edema. Hence its etiology and its significance are different. Unfortunately, the two conditions are not always easy to differentiate; if they were, their value as a diagnostic aid would be greater. Moreover, the two may occur together—i. e., edema and inflammation, the edema being in part inflammatory and in part mechanical.

The optic nerve may be the seat of a neuritis located so far back of the eyeball that no inflammatory changes can be seen with the ophthalmoscope—retrobulbar neuritis. Here the diagnosis is made in large part by the effect of the inflammatory process on the function of the nerve. This effect is an impairment of vision, particularly of the visual fields. Of course, in many cases of retrobulbar neuritis there is evidence of it to be seen with the ophthalmoscope; but in some the fundus is negative.

The visual fields are one of the very important ocular aids to diagnosis in cases of headache. When the lesion is so located as to damage any part of the easily damaged visual paths or centers, the effect is so prompt and so definite that the visual fields have a significance not only when a defective field is present (positive finding), but the absence of a defect (negative finding) is very strong evidence of the absence of a lesion in this area.

Lesions are common involving the chiasm, and then beautifully exact localization is sometimes possible by the fields.

On the other hand, the information from fundus examination of the retina is often general—lacks definiteness—as, for example: Sclerosis may be evident in some of the retinal vessels. This throws suspicion on vessels in other parts of the body, but does not enable one to say that sclerosis is present in a particular area under suspicion in the brain. It may be a great aid in reaching a diagnosis when taken with other evidence, but lacks the brilliant positive definite character of some field changes.

So with retinal hemorrhages, which are due to so many causes that the diagnosis must be continued by the internist, who has far the larger part of the job.

Pupil changes may be of great significance, but do not usually require the aid of an ophthalmologist for their recognition. Diplopia may be easy to recognize, or it may be very difficult, and in any case its measurement and interpretation as to site of lesion and its probable character require the aid of an ophthalmologist who has devoted some attention to that class of cases. One of the most valuable means of deciding whether a diplopia is causing certain symptoms, say vertigo and nausea and bad feelings in the head, is to cover the offending eye for a day or two. If one is not sure which eye is affected, then both should be covered.

If a headache is ocular (due to use of the eyes), it can be eliminated by stopping completely the use of the eyes—e. g., by bandaging them; but if the headache is periodic and not constant, it may not be practicable to cover the eyes long enough to decide the question. In a very bad case it may be a useful procedure to cover the eyes for a week or more to see what effect is produced.

By way of summarizing some of the important points:

Since headaches are more often due to the eyes than to anything else, the eyes should have careful study in every case of repeated headaches.

Since eyestrain is very common in eyes with extra good sight, the presence of good vision is no ground whatever for thinking a given case of headache is not ocular.

Location of headache is not a very valuable guide.

Severity of headache does not depend on the magnitude of the refractive error. It depends on the efforts, usually quite unconscious, made by the patient to correct it, and on his susceptibility, often hereditary.

The presence of headache in the family history and its incidence in the personal history demand most careful scrutiny.

Nothing short of the harmless therapeutic test (wearing glasses) is conclusive, and even then one man's efforts are not enough, often success follows the failure of several good oculists, so elusive and difficult is the elimination of eyestrain in some cases, so easy is it in most.

In headache there is almost always more than one causative factor at work. Eyestrain may be the easiest of these to remedy, and that may suffice, because the others alone are insuffi-

cient to produce headache. But sometimes treatment must cover the others also.

Although refractive error may have been present for forty years, it may have caused no noticeable headaches or eyestrain up to the time that some other factor came to the aid of the refractive error—e. g., illness, fatigue, age (presbyopia), over-work.

When several factors have been at work jointly causing the headache, glasses may have given relief by eliminating one of these factors. Later on, one or more of the other factors may have ceased to operate so that the refractive error can now be taken care of by the eye itself without the aid of glasses and cause little or no discomfort. It is in such cases that the glasses may be thrown away with no immediate recurrence of trouble (one of the types in which Bates gets his most brilliant and deceptive results).

A competent oculist may have examined a case and said no glasses are needed. Later, another oculist may examine, when other factors are involved, and may prescribe glasses with relief. Later still, a third oculist may say, Throw away your glasses. And yet all three may have given the best treatment at the time.

The mechanism of headache from eyestrain is an unsolved riddle. Fatigue, hyperemia, local and central, with consequent tension on the sensitive membranes of the brain, toxins from fatigue, with possible action on the sensory cells, are factors which have to be considered.

XLIX.

THE RHINOLOGIC ASPECT OF HEADACHES AND  
CRANIAL NEURALGIAS.\*

BY D. CROSBY GREENE, M. D.,  
BOSTON.

Our consideration of the nasal aspect of cranial headaches and neuralgias will deal with the sensory nerve supply of the nose and its accessory sinuses, and the lesions in this region which are responsible for the pain phenomenon.

The sensory nerve supply of the nose is derived from the first and second divisions of the trigeminus. The anterior ethmoid nerve, a branch of the first division, supplies the upper anterior part of the nasal chamber and sends fibers to some of the anterior ethmoid sinuses and to the frontal sinuses. All the rest of the surface of the nose and of the accessory sinuses derives its sensory innervation through the sphenopalatine ganglion from the second division. Motor and sympathetic fibers also pass through this ganglion from the Vidian nerve, which is made up of fibers from the great superficial and deep petrosal nerves. The sensory fibers are distributed not only throughout the greater part of the nasal cavity, including filaments to the upper anterior part of the nasal chamber supplied by the anterior ethmoid nerve, but also to the orbit, palate, nasopharynx, tonsil and tongue. Motor fibers of the lacrimal nerve also pass through this ganglion.

Lesions in the upper anterior part of the nasal chamber and in the anterior ethmoid and frontal sinuses affect the anterior ethmoid nerve terminations and produce pain referred to the distribution of the first division of the fifth nerve. On the other hand, lesions in other parts of the nasal cavity, and especially those in the posterior ethmoid and sphenoid, which are in close relation to the sphenopalatine ganglion and its afferent and

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efferent trunks, may produce pain referable to the distribution of the second division. The extension of the pain beyond this district to the occiput, neck, shoulder, arm, etc., as described by Sluder in the "Nasopalatine or Nasal Ganglion Syndrome," is attributed by him to the conduction of sensory impulses through the sympathetic nerves by way of the Vidian.

Whether we are able or not to follow Sluder in all his conclusions, this must be said: His researches in this connection into the anatomy and pathology of the nose, its accessory sinuses and the nasal ganglion, embodied in his book and numerous other publications, form the most important contribution to the subject in rhinologic literature.

The conditions in and about the nose which may give rise to headaches or neuralgias may be grouped into four classes:

- 1. Those in which the pain is due to acute inflammation in the nose or paranasal sinuses;
- 2. Those in which chronic inflammation in these regions is the etiologic factor;
- 3. Anatomic variations in structure which result in pressure contact within the nasal cavities;
- 4. New growths of the nose and accessory sinuses.

The pain is, I take it, to be explained on the basis of pressure of swollen tissues upon the sensory nerves or their terminations. When a sinus is filled with secretion and inflammatory exudate under pressure, the drainage being blocked, the cause of the pain appears obvious, but the occurrence of pain in many cases does not appear to be dependent upon the presence of pus under pressure, and is to be attributed to the involvement of the nerves or their terminations in inflammatory processes within the walls of the sinus cavities.

The pain of an acute sinusitis has one very common characteristic, namely, diurnal periodicity, though its location varies according to which sinus is involved. It is aggravated by bodily exertion and especially by the stooping posture. In a typical case it begins each day as a dull ache at or shortly after rising, gradually increases in severity until it reaches its maximum intensity about noon, after which it gradually subsides, and the patient has comparative relief during the evening and until the following morning. On successive days the attacks become more severe each day, until the peak has been

reached, after which there is a gradual subsidence, the attacks becoming milder and shorter each day, until at length they cease altogether. In the severest cases, and especially in cases of acute suppuration without drainage, there is no intermission of the pain, but in these also the pain is usually worse during the day.

Pain in acute frontal sinusitis is located in and about the eye and the frontal region. With this is associated marked tenderness on pressure of the floor of the sinus above and behind the inner canthus. In acute maxillary sinusitis the pain is referred to the upper jaw and teeth, the cheek, and often to the eye and supraorbital region. In acute inflammations of the posterior ethmoid and sphenoid, it is more diffuse and may be referred to all the areas of distribution of the nasal ganglion which we have enumerated and may extend to the occiput. In our experience it is described as most intense back of the eye, and tenderness on pressure on the globe is commonly present.

The diagnosis of acute inflammations of the sinuses can usually be readily made from the history, and definitely established by means of the usual methods of examination, intra-nasal inspection, endoscopy, transillumination and X-ray.

In cases of chronic sinusitis the occurrence of pain is by no means as constant a feature, except during acute exacerbations, as it is in acute cases. Its distribution, when present, corresponds with that observed in acute inflammations, but the diurnal periodicity is less characteristic and the pain usually is less intense. We are constantly meeting with instances of pronounced chronic inflammation, both of the suppurative and of the hyperplastic type, in which pain is entirely absent, even where the nasal ganglion is in the field of these processes. On the other hand, in some pain is a predominant feature. In my experience, chronic suppuration of the maxillary sinus is usually unaccompanied by pain, even though the cavity is filled with pus, and yet a case of this type occasionally appears in which the chief complaint is of an ache in one side of the face. For example, a woman of 65 was referred to me nine months ago on account of an aching pain in the left cheek bone, which began about a year previously following an attack of influenza and had troubled her ever since. In her case a latent empyema

of the antrum was associated with pain, which came on every day at nine o'clock in the morning and lasted until the afternoon. During the late afternoon and evening she was entirely relieved, but on the next day, at nine o'clock, the pain recurred. The antrum was opened and drained by the modified Caldwell-Luc operation, following which there has been complete disappearance of the pain to the present time.

Any consideration of the subject of pain arising in association with inflammation in the posterior ethmoid and sphenoid region must refer to Sluder's exhaustive work on this subject. He has collected a mass of clinical and anatomic evidence to show that lesions in this area affect the nasal ganglion or its roots and produce characteristic neuralgias, involving not only the regions supplied by the sensory fibers passing through the ganglion, but also remote districts, the mastoid, occiput, shoulder, arms, etc., the pathway to which, he believes, is through the sympathetic fibers which pass through the Vidian, by the great deep petrosal nerve, to the carotid plexus and thence to the cervical sympathetic ganglia. Many reports by others confirming his clinical observations and favorable results of treatment by surgery and alcohol injection of the ganglion have appeared in the literature of recent years. On the other hand, many observers have been unable to confirm his results. The logic of Sluder's theory depends upon the establishment of the fact that the sympathetic system has a sensory function, and until this question is settled for us by the neurologists the theory must hang in the balance. If proven, it would explain many instances of relief from pain in remote regions from cocainization of the ganglion which have been reported, such as pain in the lumbar region, dysmenorrhea and dysphagia. Conversely it would explain the relief from nasal vasmotor phenomena experienced by women after operations upon the pelvic organs. In this connection, the preponderance of women among these patients is a noteworthy fact.

In the practical question of diagnosis in these cases, it is necessary to apply all the means of local examination at our command, namely, careful rhinoscopic examination, after shrinking with cocaine adrenalin, endoscopy, X-ray investigation, and lastly the effect of cocainization of the sphenoid recess and the sphenoid sinus. It must be remembered that pain due

to a lesion within the sphenoid sinus is not affected by cocaine-ization of the ganglion, but may be relieved by anesthetization of the sphenoid cavity itself, which lies in relation not only with the Vidian nerve but with the second and third division of the fifth nerve, and in some cases with the Gasserian ganglion itself. The existence of one sided headache, associated with definite evidence of pathology in this region, together with relief of pain by anesthetization of the nasal ganglion, suggests a causal relationship which justifies surgical interference. There are two opposite directions in which we are liable to err in dealing with these patients. The first is in the tendency to overemphasis of a slight local lesion as the cause of a pain, which may be functional in its origin, and thus lead to the subjection of a patient to operations which may result in leaving him in a worse condition than the first. The second is in the tendency to disregard as unimportant local lesions, which may be wholly responsible for the symptom. The situation is in some cases one which calls for the exercise of the most careful judgment and in which we should avail ourselves of the cooperation of the internist and neurologist. Some of the cases I have seen which presented signs of Sluder's nasal ganglion syndrome have been patients who impressed me as definitely of the psychoneurotic type. I have recently seen such a case in which a definite posterior sinusitis was present, and the patient operated upon by a colleague three years ago with a perfect local result, but no relief from pain. At the present time she is suffering more than ever. I question whether Sluder's remarkable results are not in part due to his dominant personality as much as to his unquestioned skill, for both of which we have the most unreserved respect and admiration.

Another group of cases in which the nasal origin of headaches is present is comprised of those in which may be found evidence of anatomic variations in the nose, which result in pressure contacts between the inner and outer walls. Such contacts may be due to deviations or thickenings of the septum, especially in its upper part, on the one side, or to enlarged or cystic middle turbinates on the other. These contacts may be present only during attacks of acute inflammation, or they may be constant and exaggerated during such attacks. I would include in this group the cases described by Sluder

under the head of vacuum frontal headaches. In my experience, most of the cases of contact which have been relieved by surgical treatment are those in which the anterior end of the middle turbinate has been removed or a high submucous resection has been done. I have not seen relief of headache by the correction of anatomic faults, such as deviations and ridges in the posterior half of the nasal cavity. The pain is referred to the cheek bone, the eye and the frontal region, as in cases of acute anterior sinusitis, and is often characterized by the same periodicity. It should be observed in this connection that marked pressure contacts occur in many instances without accompanying headaches, and we are forced to the conclusion that here also, as in the case of chronic sinusitis, the local condition is only one factor in the causation of the headaches.

New growths in the nasal and accessory cavities are sometimes the cause of neuralgia, even in the earliest stages of development, especially in the deeper parts, the posterior ethmoid, the sphenoid and nasopharynx, where their presence may be difficult or impossible to distinguish. This is more often true of carcinoma than other and less malignant types. Here is one direction in which, by the thoroughness of our study of cases of headache, we may be able occasionally to uncover malignant disease in its early stages, when it is most susceptible of surgical treatment, and not only bring about relief from suffering but save life itself.

L.

TEACHING METHODS.\*

By H. P. MOSHER, M. D.,  
BOSTON.

I am sorry that I have nothing to offer today that is "nobly new." Someone once dubbed the efforts of a man whistling in a bathtub as "art for art's sake." Some of you, I suspect, may be tempted to characterize my efforts by the same phrase.

I have been teaching the applied anatomy of the nose and throat for many years, teaching mainly graduate students who are on their way to the promised land of the specialty of laryngology. In my teaching I have made great use of drawing. Then I turned to making casts, and during the past year the making of casts has been supplemented by a little modeling. The whole object of these aids to teaching is to focus the attention of the student long enough for him to visualize the specimen on which he is working and give him a permanent record for after study. He has something to show, and, if he is so inclined, something to brag about.

All these processes are made as simple as possible in order that the student may quickly accomplish something and not feel that he is spending his time trying to qualify as an amateur artist. For instance, all the drawing is done with a tracing box. Anyone can quickly make a passable outline drawing with this device. The tracing is finished free hand. Here the student can give much or little time, as his enthusiasm dictates. Often the first drawings are crude, but I have been repeatedly surprised to see how soon real artistic excellence appears in the finished drawings. Artistic excellence is welcomed but is not necessary. Every year I have drawings which would do credit to professionals. Every year some of the men groan a bit. "I can't draw," is a phrase which I hear a good deal the first few days. Soon, however, the spirit

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of emulation appears and little more is heard of the phrase. I harp on the word *visualize*. I insist that everything be measured and the measurement recorded on the drawing. Much of nose and throat operating is done in the dark. Every measurement taken on the specimen leaves its record in the cerebellum and helps automatically on the living. The cerebellum never forgets. When a few drawings have been accumulated each man sees that he is making his own anatomy. The story has come to me that you can tell a man who has taken the March course, as it is popularly known, by the following happening. "Have you taken the March course?" the old course man asks another. If the other says "No," the questioner says, "Wait a minute and let me show you something," and he goes to a drawer and pulls out his collection of drawings.

For years I have featured drawing from specimens. In fact, the collected drawings make the backbone of my graduate course. Each man makes from fifty to seventy. I attempt to teach only applied anatomy. Applied anatomy is the slogan which wins the men. In drawing, they are recording facts which they will make daily use of later.

I made my greatest hit—if I may be allowed to use that somewhat egotistical phrase—when I had the men make plaster casts. Dry or wet specimens of the head lend themselves to casting very nicely. The cast retains something of the individuality of the specimen. Unlike the original, it does not have to be preserved in alcohol. The only care necessary is not to have the maid drop it if she ever dares to dust it. If you are given to showing specimens to patients—which I think is rather cheap, but I am a bit old fashioned on this point—you can do it with casts with less of the feeling that you are exploiting the dead. Furthermore, with casts you do not invariably provoke from the patient the question, "Was it really once alive?" If you have to answer "Yes," you know that you are playing to the grandstand.

What I started to say when I wandered off into this sermonizing was that the men took to making plaster casts of the head like ducks to water, or rather like children to mud pies. There is something elemental in mud. The first woman was made of it. We go back to it instinctively. The instinct

to make something is fundamental in all of us, and grown men readily revert to it.

I wish you could drop in on the course, or if the course is not on, could come to the medical school some Friday night and see how happy and busy the house officers are and what a mess they make. Last year during the course the laboratory sink was stopped up three times with plaster, mud and wax. Fortunately, opening the trap and cleaning it was sufficient. We did not have to blast the cement floor. de Cloedt, my present long term Belgian student, was asked what he was going to say when he wrote his impressions of America. "America I have not yet seen," he answered. "About the course I shall not have to write much, only three words, mud, plaster and glue"—glue being the latest casting material which we are using.

Prohibition and prosperity have brought with them other disadvantages besides bootlegging and inflated prices. Prohibition is the chief cause of the famine in dissecting room material. The anatomic department has been more than generous to me in this matter. Every scrap of material, however, has to be made the most of. All the large medical schools are handicapped in the same way. I have found that casting from wet and dissected specimens supplements dissection and can in a measure be made to take its place.

**Head Holder.**—The third year students are divided into sections for the clinical work in laryngology. Two of the twelve exercises are anatomic demonstrations at the medical school. An adjustable wooden frame for holding a head for examination has proved very serviceable. On a head held naturalistically, as it were, the student gets practice in using his head mirror, the nasal speculum and the postnasal and laryngeal mirrors. While waiting their turn they examine each other. This frame is used in postgraduate teaching to hold a head for practicing the ethmoid operation.

**Annotated Specimens.**—Annotated specimens are used chiefly for teaching third year students, but they are used to some extent in work with postgraduates. The frame of the tracing box is used to hold an annotated drawing of a selected specimen. A small tray for the specimen is attached

to the larger box and keeps the specimen and the drawing always together.

Tracing Box.—The tracing box is the backbone of all the drawing done by the student. Without it I should never have the heart to require all students to draw. With it I have no compunction.

Plaster Casts.—I have learned as much from the making of plaster casts of sections of the head and neck as the students have. The attraction of the cast is that it retains some of the individuality of the specimen from which it is taken and has three dimensions, whereas a drawing only has two, the sensation of depth being only a trick of the pencil.

Cross sections of the face and head are ideal for making impressions from which to make casts. The method of making a cast is simple. A layer of modeling clay is spread in an ordinary baking tin. The surface of the clay is oiled and the face of the specimen to be reproduced is greased with vaselin. Then the imprint of the specimen is made by pressing it down into the clay. A little practice soon produces a clean impression. The layer of clay about half fills the depth of the pan. After the impression is secured the sides of the pan above the clay are greased with vaselin and the pan is filled to the top with plaster. In half an hour the plaster has set, and plaster and clay can be removed together. Then the clay is removed from the plaster and the cast washed. While the cast is still wet it is trimmed. The ambitious often touch it up free hand with modeling tools, using the original specimen as copy. Later, when the cast is dry, it is painted. At first we used conventional coloring. Later we found that it was easy to be somewhat realistic, and the casts which I show today are done in this manner.

In casting wet tissues, like a dissection of the side of the neck, wax is used. A moat of clay is made about the specimen, and melted wax which has been allowed to cool sufficiently so that it will not burn is poured over the specimen. Wax takes at least two hours to harden. If the mould is thick it is better to wait over night before removing it. When the mould is ready it is greased and poured with plaster. To remove the wax both wax and cast are placed in hot water

for some twenty minutes and then the wax is pried off. If there are not many under cuts the mould can be removed intact and can be used again a number of times. If there are many under cuts, projecting parts of the mould generally break off so that it is not worth while attempting a second cast.

Artists have a composition the basis of which is glue, which they use for making casts which have many under cuts. Recently I have been using this material. With care the same mould can be used many times. This composition, however, requires much more time to harden, and so is slower to work. I have not yet learned its ingredients. I buy it from a novelty and joke concern who make the comic faces which you hold in the hand and squeeze and so change the expression.

In this casting work I have learned a number of shop tricks or methods. These I shall not burden you with. My purpose is to lead up to a display of what the men have done, and to tell you of the enthusiasm with which the men make these casts. I find that the house officers from the hospital who come up to the school Friday nights are as eager as the post-graduate students. What they think of the casts is told by the expression which I often hear, "These are way ahead of drawing."

Plastic Wood.—I have found it convenient on occasion to make my own class room models. Papier mache models are very slow to produce. Through Dr. Begg, who was once one of us and still is in spirit, I hit upon plastic wood. This is a patented preparation which is soft like putty and hardens to the consistency of wood and can be worked like wood. It is a bit expensive and has a vile smell, so that I have been forbidden to use it at home except in the cellar. I tried it first in making puppet heads and small statuettes. In using it you first make a clay model. Then a plaster mould of this, and from the plaster mould make the plastic wood cast.

Wood's Metal.—I am very fond of having the students make a cast of the exenterated ethmoid labyrinth. Such a cast enables them to visualize this structure better than any other way that I have found. Wood's metal is too expensive for general use, so I have a stock cast of the labyrinth made of

the metal. From this impressions can be made in clay and then cast in plaster. Wood's metal, or something which for all practical purposes is the same thing, is used by firms making automatic fire extinguishers. After convincing such a firm that I was not trying to become a business rival I have been able to get from them as much of the metal as I can afford to buy.

For small casts, like the trachea and bronchi at birth, I use this metal also. A cast of the accessory sinuses of one-half of the head and mounted on a plaster base in such a way that each sinus can be removed for study makes a most useful specimen. This method of mounting may be old, but I hit upon it only recently.

This plaster work which I have been describing is done in a room nicknamed the "slop room." This it is in reality. It is probably the messiest room in the medical school. Nevertheless, I take great pleasure in what goes on there. My only worry is that the sink will stop up beyond the trap. This would probably mean the loss of my job.

LI.

THE NONSURGICAL TREATMENT OF NOSE AND  
THROAT DISEASES.\*

By PERRY G. GOLDSMITH, C. B. E., M. D., C. M.,

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A paper dealing with the nonsurgical treatment of a class of ailments fashion has decreed shall largely be the drift of the zealous surgeon, the happy hunting ground of the embryo otolaryngologist, may have in it some features that offer to our patients relief from their discomforts without recourse to harsher measures.

Hamlet says, "It is better to bear the ills we have than to fly to others we know not of."

I do not wish to belittle in any way the marvelous help surgery has given our specialty, or its great influence in placing otolaryngology on a firm foundation.

But surgery—i. e., the mechanical part of the art that enters largely in its spectacular picture—suffers not from too little but too much attention. Sydenham wrote 250 years ago that "True practice consists in the observations of nature," and it has been aptly said, "The successful surgeon should be an optimist, but rose colored spectacles should not be included in his gifts."

Many years ago, while working in London with Dundas Grant, now Sir James Grant, he was wont to impress upon me that it was more creditable to cure a patient by medical measures than by the most brilliantly conceived operative procedures.

One would hardly expect to hear such dogma now, but it was a good creed then, and to some, nay, many, it would form a text they might well frame on their surgery walls. Anyhow

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it was in such atmosphere I absorbed my early training, and maybe this permits me, without egotism, to offer the following remarks about otolaryngologic therapy.

I will endeavor to give you the details of my own practice rather than attempt to outline or particularize all the therapeutic measures we have at our disposal. This will probably mean a very elementary essay, still I hope the discussion may bring out many favorite nonsurgical measures that have served some of you faithfully over years of practice. "From a long array of cases we can gain knowledge that a single case can never disclose. The years teach us much that the days never disclose. When those who are responsible for much of our modern medical and surgical literature will act on this truth, less ink will be spilled and more truth told."

**Nasal Vestibule.**—The most frequent diseases present in this area—the septic area of the nose—are the socalled vestibular eczemas, furunculosis and lupus, the structural abnormalities being septal dislocation and alar collapse. The acute inflammatory conditions are treated largely on the line of similar conditions elsewhere in the body. When a small abscess forms it is usual to find a hair in the center, and removal of this will likely clear up the case at once; otherwise it becomes a surgical procedure. Very great gentleness will well reward one in examining these cases, for they are very sensitive. To prevent recurrence, for boils have a tendency to become multiple at times, the use of unguentum hydrargyri nitratis, 2 drams, in oil of sweet almonds, 1 oz., will be found very beneficial, the mixture being gently rubbed into the entire vestibule. White precipitate ointment, 2 to 4 per cent, is another favorite that has stood the test of time. A very good spray for crustings just within the nose is nitrate of mercury ointment, grs. 40, olive oil, drams s. s., liq. paraffin ad., 1 oz.

When the vestibular irritation is of the acute eczematous type, nonirritating applications are of value, such as liquor carbonis detergens, 1 to 4 parts of water, or calamine lotion made up with lime water. The chronic type with the formation of fissures is sometimes very annoying and intractable. Here one may find the use of weak chromic acid, silver nitrate or trichloracetic acid of more value. The actual cautery may even be required. It must not be forgotten, too, that chronicity may

be kept up by those who work in irritating dust, as copper miners, or in those whose nasal secretions are very septic or otherwise irritating, and measures directed to alleviate such conditions should be sought.

Collapse may be redressed in the young by nasal breathing exercises, to cause the dilator muscle to act regularly and thereby become stronger, or some simple dilating contrivance may be used at nights in the case of adults who do not desire any plastic operations.

Septal ulcerations about Little's area (incorrectly called Kesselbach's) generally respond to one of the various cauterizing agents such as silver nitrate, trichloracetic acid, or the actual cautery. Small bleeding area on the cartilaginous septum requires similar treatment, but one must remember that epistaxis is not always associated with ulceration, and persistent and recurring nosebleed demands the exclusion of such diseases as hyperpiesis, chronic kidney or liver diseases, uncompensated heart disease, mediastinal pressure tumors, the various blood dyscrasias, even typhoid with nasal ulcer, or the advent of some of the acute infectious diseases, as pneumonia or the exanthemata. An ulcer, however, with raised edges, situated well back in the nose, should give rise to the suspicion of syphilis and be treated accordingly. When we have a chronic ulceration at the junction of the skin and mucous membrane, and lupus is diagnosed, I think scraping and diathermy is the best form of treatment.

The treatment of intranasal conditions has to do, in the main, with alteration in the nasal mucosa. Here we have a delicate, sensitive tissue, aptly termed by some the inner skin, covered with a thin layer of ciliated cells. This lining is richly supplied with blood vessels, nerves, and in some areas are found many glands, whose secretion is poured out on the nasal mucosa. Just as our outer skin depends so largely on our general health, so does the inner skin show marked alterations when subjected to various irritations, either external or internal in their origin. This is shown very well in the experiments of Meukei, who found that cold air blown on the soles of the feet causes an immediate alteration in the nasal mucosa. Edema then, or a varying amount of edematosis, a word

given by Baum, is the basis of most of the chronic conditions within the nose.

Structural alterations, such as a deflected septum, and a straight septum Fraser speaks of as being abnormally normal, may well form the foreground of our picture, but the real cause of obstruction and symptoms may be due to vascular changes—turgescence—or edema of the mucosa. Our picture of the amount of septal deviation is often considerably altered after thorough shrinking of the mucosa, and I suppose you have all been a little surprised to see really how small the septal deviation is after the preoperative packing has been removed. There is in reality a thickning of the septal covering sufficient to cause the discomfort of nasal insufficiency, or the results from impaired nasal irritation of drainage. So, too, may the same conditions exist in the covering of the turbinate bodies, but there is superadded a vascular element more extensive, owing to the presence of large blood spaces or channels. This change of mucous membrane is in its acute phase largely due to what we call infections, such as acute head colds, or influenza, and we speak of it as acute rhinitis.

There is no surgical treatment for acute rhinitis; medical men depend, I think, largely on measures directed to the relief of the common head cold. My own practice is to give quinin and Dover's powder and maybe some aspirin. Confinement to one type of atmosphere is better than moving about from cold to heat or vice versa.

Local treatment should be, I think, just enough to lessen the main discomfort, for it is a self limited disease, and if no complications ensue will rapidly get well. Inhalations of menthol and Friar's balsam in steaming hot water or the use of mentholated steam, with or without eucalyptus, are pleasant, at any rate. The use of compressed air spray is an abomination in this condition. The exudation of mucus on the nasal membrane is Nature's protection, and if not excessive should be left alone or blown out in Nature's own fashion. When it is desired to clear it away, and this is very grateful to the patient, there is nothing, in my mind, equal to the old fashioned enema syringe, using a soft rubber tip. The solution used should be very bland, such as 2 per cent solution of sulphate of soda, normal saline or weak boric acid solution; injected in one nos-

tril and, with the head forward, it comes out the other side. The use of 5 or 10 min. of Friar's balsam adds, I think, to the efficiency of the mixture. Care in blowing the nose and avoidance of exposure afterwards are essential. If an oil spray is used afterwards, and all noses seem to require oiling, the amount of menthol should be very weak, for it is an irritant and a stimulant, though possibly a little anesthetic in its action. Argyrol is often used as a spray in the subsiding stages of acute rhinitis; I think it has some virtue. When a nasal spray is used it tears off areas of cilia, and frequently we see little red spots, possibly a little bleeding, surely not a desirable method of procedure in acute inflammatory conditions of the nasal mucosa. The ophthalmic surgeon does not so treat an acute conjunctivitis of simple origin. With the subsidence of acute condition the mucosa secretion becomes more tenacious, and areas of crusting may form, especially if rough spraying treatment has been used. Here the use of nonstimulating lotions is desirable. Such a one might be used:

R	Bicarbonate of sodium.....	grs. 5
	Borax .....	grs. 5
	Acid carbolic .....	grs. 1
	Water ad. to .....	oz. 1

M.

Repeated attacks of acute rhinitis lead very often to a chronic form of rhinitis, with or without overgrowth of tissue. One form is that known as rhinitis sicca, a variety of dry rhinitis to be distinguished from what is known as atrophic rhinitis by the fact that the crustings which occur in both forms have in the sicca type no odor and the turbinates are full and rounded rather than atrophic. The treatment of this type depends on which form the disease takes. There are the plethoric and anemic varieties. The former occurs frequently in people with gouty tendencies, especially if they are alcoholic or dyspeptic, and in people of full habit of body, especially if they indulge their appetites too freely. The condition reflects more credit on the skill of the cook than the alimentary austerity of the diner. Those whose work is among millers, stokers, boilermakers and engine room workers are commonly affected. Nasal stuffiness, crustings and, in spite of general dryness of

the mucosa, profuse watery discharge are excited by changes in temperature or exposure to cold winds.

The treatment is both general and local. Attention to diet, exercise and free bowel evacuation are essential. Alcohol and tobacco should only be used to great moderation. Outdoor exercise and Turkish baths are of value also. Locally, gentle stimulation of the mucous membrane and the prevention of crusts, especially on the septum when they tend to cause perforation, are the chief indications. The best local stimulation are sodium chlorid and ammonium chlorid; 5 grs. of each might be added to any simple alkalin solution. Crusting may be lessened by various oily sprays or better, by ointments containing acid boric, bismuth subnitrate and zinc oxid. Mucine is fancied very much by Stuart Low, and I sometimes employ it in combination with a small quantity of menthol.

The anemic type shows pallor of the mucosa, arrest of secretions and tendency to form small crusts. It is common in females, while the plethoric is more often found in the male. Perforation of the septum is not uncommon. The general treatment is similar to the plethoric type, having regard to the type of patient. Care and attention to the general health, with the administration of iron, arsenic and cod liver oil. Locally the treatment is the same as the plethoric type. The discomfort produced by this disease, I feel sure, in so far as dryness is concerned, is directly related to our methods of heating our houses. We have them too warm and far too dry, the air going to our lungs being too dry in the first place and not getting sufficient physiologic moisture in such nostrils, passes into the respiratory tree in a state Nature does not accept without protest, which we see in the varying pathologic state of the respiratory mucosa. There is much to commend the placing of receptacles containing water in various places in our houses, so that the air is made more moist and the discomforts from excessive dryness alleviated.

Chronic rhinitis with overgrowth, especially along the inferior turbinate body, is one of our most common disorders. Granted it is a change in the nasal mucosa, with permanent dilation of the underlying blood spaces associated with patients who have had, over a considerable period of time, various types of acute rhinitis, there still remains the fact that the

process is essentially one of altered general metabolism. We are taught that if the mucosa shrinks under cocaine, there is no hypertrophy and the case is not one of hypertrophic rhinitis. This is true, so far as the development of a large amount of fibrous tissue is concerned, but long before the dense overgrowth and irregular contractions take place, the patient experiences all the discomforts of the fully matured changes. Periodic alternating nasal obstruction, due to the instability of the vasoconstrictor mechanism of vessel space in the early stages of hypertrophic rhinitis, may be relieved by careful regulation of the patient's habits, diet, exercises and excretions. Regulation of the heating of the sleeping apartments is important. Even the feather pillow on which the patient lies is a matter of great importance. Local treatment is the least concern, washes to the nasal mucosa, perfumed oils sprayed into the nose makes him feel better and gives those who like it an opportunity of office treatment. Occasionally, a little silver, 20 per cent, applied along the lower scroll of the turbinate, stimulates it to contract better. I like to give my patients the following application, used, if you wish, in an atomizer: Sodium biborat, grs. 5., zinc sulphate, grs.  $\frac{1}{2}$ , hazaline (B. & W. witch hazel), 30 min. to the ounce of water. Dense obstructing overgrowth, especially at the posterior ends of the turbinates, requires surgical measures. Have a care, however, how you sacrifice turbinate tissue for discomfort that may and ought to respond to general systemic therapeutics. The electric cautery I use only occasionally.

Recently a patient of mine whose nose came within what might be termed normal limits went to England. Those of you who have gone there in the winter time will probably not be surprised to know that her nasal mucosa underwent a marked change, turgescence being the main feature. She was of a nervous type and was induced to see specialists. One advocated an antrum operation to relieve the discharge from an edematous mucosa, another the removal of her posterior tip enlargement, while another still suggested the removal of her tonsils. I said to myself, "So this is London." How different in my time. On returning to the Canadian climate and to the simple life we Canadians try to live, she rapidly improved—but she still has her tonsils, for how long—I wonder.

Atrophic rhinitis, with or without fetor, is familiar to you all, and until recently has been treated by topical applications and douches. I have used them all. Glucose and glycerin seem as good as any, maybe a little better, depending on the efficacy of its application by the patient himself. I always advise my patients to make up their mind to perform a nasal toilet once or twice daily for years to come. I do not have them come for office treatment, but only see them occasionally. There may be some hope for surgical measures directed to narrowing the nasal passages, but I have had no experience of this. Mostly in neurotic females the form of chronic edematous rhinitis, associated with a pale boggy mucosa and a free flow of watery fluid occurring, is familiar to you all. Most of these patients, when sensitized, show nothing to account for the condition. Local treatment is useless—so, too, in the main, is general treatment. My practice generally is to order some liq. strychnia and atropin, hoping thereby to relieve some of their discomfort. Recourse to surgery is usually a sad disappointment. Over a period of years many get better, some become well with a fairly normal mucosa—why, I do not know. Some say it is an endocrine disturbance, but I have no ammunition for any endocrine blunderbuss.

Acute and Chronic Sinus Inflammation.—The accessory nasal sinuses have suffered much from indiscrimination and overzealous surgery; probably no area of mucous membrane has suffered as much. In the beginning of all inflammations of the mucous membrane, serous exudation takes place from the mucosa, mixed with mucus in varying proportion, depending on the number of glands excited. The mucin and albumin present accounts for the gelatinous character of the fluid. This exudation is Nature's protection, and Yates has shown that the severity of a sinus infection depends upon the power of the mucosa to prevent its destruction by the microorganisms, and if the property that mucus possesses of preventing the passage of water, and hence of water soluble toxins, is destroyed, that a progressively increasing poisoning by these toxins of the ciliated epithelium occurs. As the ciliary paralysis increases, the amount of secretion of mucus is also paralyzed, until finally the microorganisms come to dwell in a symbiotic state

in the sinus and the toxins from them are readily absorbed with the possible production of remote symptoms.

When in an acute sinus inflammation there is free discharge and no severe pain or very marked systemic disturbance, it is obvious that the best treatment is to see that the cilia of these cavities are able to wave the mucus or mucopurulent material away, and to aid by general supportive measures the well being of the patient, so as to lessen the liability of the cilia to be overcome by the toxic products of the infection, for if this takes place chronicity of the inflammation with a purulent type is a strong probability. The general intranasal congestion and edema may be lessened by the following measures:

1. Confinement to an even temperature, in bed if possible.
2. Free evacuation of the bowels.
3. Diaphoretic mixture administered at intervals.
4. Hot fomentations to the face and forehead.
5. Cleansing the nose with a nasal douche, using only a bland alkalin solution. Wingrave says, "A 2 per cent solution of sodium sulphate dissolves the mucus and globulins of which the secretion largely consists, better than anything else, while the addition of 2 per cent solution of carbonate of soda assists in breaking up the envelope of the pus cells."
6. Frequent blowing of the nose or hawking the secretion back into the throat not only mechanically removes the secretion back into the nose but helps to draw it out of the ostium.
7. Suction may be used to remove the nasal secretion and to draw the exudation from the air cells. In some cases this is excellent, for one may be able to remove several drams from the antrum and rapidly cause resolution. It does not seem to act equally well in all cases. Posture of the head has a great influence in the success of suction.
8. Measures directed to shrinking the nasal mucosa about the ostium, such as cocaine and adrenalin, act well in some cases, but in others the reactionary swelling makes matters worse than before the use of these remedies.

It should be remembered that all acute sinus infections tend to get well itself. If retention with pain, etc., ensues, further measures may be required.

Irrigation through the natural ostium of the maxillary antrum may succeed, but I seldom find it satisfactory. Punc-

ture through the inferior meatus, with lavage, comes rather under the head of surgical procedures, so will not be discussed. When the character of the secretion removed is like a semi-transparent mucoid blob, the patient is better left alone, as the cilia will then rapidly clear this away in Nature's own fashion, while puncture and irrigations are then irritating. Logan Turner speaks highly of the electric head bath in acute sinus involvement. I have no experience with it.

When the brunt of the inflammation is in the frontal sinus, attempts to probe or irrigate the frontal nasal channel are likely to do more harm than good. If one can only do this in, say, 30 per cent of cases, when no inflammation is present, how much more difficult and harmful must it be when this tortuous channel is the seat of acute inflammatory edema. Chronic sinus involvement has little to expect from medical measures, but this does not necessarily mean that all cases require surgery. When a sinus is well ventilated its mucosa is not always productive of so much discomfort that severe surgical measures are essential, for no surgical procedure can restore the mucosa to its normal condition when once profound edematous overgrowth has taken place. I have come to view many of the chronic hyperplastic changes in the lining of the air cells as being related to an edematous diathesis. The pathologic change takes place in the gall bladder as chronic cholecystitis and in the bowel as chronic colitis.

Nasal Neurosis.—Purves-Stewart defines this condition as follows (British Medical Journal, Nov. 29, 1924): "A neurosis may be defined as a molecular abnormality of the nervous system (whether cerebrospinal or vegetative, or both together), characterized clinically by abnormal reaction to ordinary stimuli. These stimuli may be physical or emotional; they may arise outside or from within the patient's body. The abnormality of reaction may consist in excessive response, in diminished or absent response, or in some unusual or strange response. We must recognize that the neuroses are real diseases, with positive clinical phenomena as real as smallpox or cancer."

Underlying this condition we have a disturbance of the somatic sensory and anatomic nerve supply. This subject is

an enticing one and much too important to hurriedly rush through. Neil MacLay of Newcastle on Tyne, in the British Medical Journal of Nov. 29, 1924, has a very illuminating study of this subject. Speaking of the sphenopalatine ganglion, he says: "Whether the sphenopalatine ganglion is purely parasympathetic or of a mixed variety cannot definitely be stated. It can, however, be assumed with some certainty that the postganglionic fibers, in common with those of the autonomic system in general, are of two varieties and possess distinctive functions. Those fibers which are described as sympathetic convey efferent impulses of vasoconstrictor and secretory nature, while those named parasympathetic deal with impulses which produce vasodilatation as well as secretion.

It should be remembered that the ganglion cells cannot originate an impulse without stimulation from the central nervous system. The excitation of impulses in the autonomic system in general may be the outcome of psychic action, of which there are many well known examples. On the other hand, the involuntary impulse may be due to the action of drugs and proteolytic products which may act locally or through the blood stream, and there is experimental evidence to show that the sympathetic and parasympathetic secretions respond in different ways to various pharmacologic products; thus one drug may cause constriction of the blood vessels and dry up secretion, while another will produce the opposite result. If drugs and proteolytic products can so affect the involuntary nervous system, I think we may reasonably assume that toxins may play an equally important part.

Especially interesting, too, is his experiment with guanidin, a proteolytic ferment found normally in the large intestine, and to a small extent in the blood, and is known to be increased in amount in certain intestinal conditions.

A rabbit weighing 1.9 kilos, after an examination of its nasal mucosa, was given 0.1 gram of guanidin hydrochlorid into a vein. In a few minutes the animal became less active and showed signs of salivation, masticating movements, and frequent rubbing of the nose and mouth with both forepaws. Within ten minutes saliva poured from the mouth, and it assumed a dull and listless attitude. Examination of the nose revealed turgidity of the mucous membrane and a definitely

increased amount of clear watery mucus. The animal was now given 2 c. cm. of a 2 per cent solution of calcium chlorid into the vein. Almost immediately signs of returning activity were noted and diminution of the salivation. In five minutes the flow of saliva had ceased and the animal became active and sniffed about its cage. Ten minutes after the injection of calcium the nasal mucosa had apparently returned to its normal state and there was no sign of excess of mucus in the nose.

Those experimental data seem to me to indicate the fact that the nose can be influenced by blood borne agents and intranasal conditions be established which in all respects resemble what is commonly known as catarrh. Moreover, I think it may be assumed that a variety of blood borne agents may bring about those phenomena, as well as animal emanations and the pollens of flowers and grasses.

It is generally conceded that gastrointestinal disturbance, and notably the torpid colon, may lead to the development of nose symptoms of a catarrhal nature. Observations suggest that there is a definite connection between autoinfection from the bowel and those nasal symptoms which may be classified as autonomic sensory, and the results obtained by the experimental use of guanidin lend some support to this view. It seems reasonable to suppose such systemic blood contamination may be an important causative factor in the catarrhal condition of the nasopharynx in early life. It would even seem possible that this disturbance of the mucous membrane might lead to hypertrophy of the lymphoid tissue which composes Waldeyer's lymphatic ring, and which in its wet and bulky state becomes infected with bacteria, the action of which is likely to aggravate or perpetuate the catarrhal state.

MacLay's conclusions are as follows:

1. The nasal neuroses are real clinical entities.
2. They are, to some considerable extent, excited by blood borne agents, animal emanations and the pollens of flowers and grasses, in predisposed subjects.
3. Comparatively few noses fail to show some evidence of this involuntary nerve sensitiveness.
4. The neuroses may explain the pathology of the mucous polypus.

5. The neuralgic syndrome may lead to confusion in diagnosis, particularly in regard to pain in the ear and the mastoid process.

6. The manifestations may occur alone or in conjunction with pathologic or anatomic defects.

7. If a neurosis is present, together with a structural defect or pyogenic infection, it must be included in the treatment in order to insure success.

Vaccines.—I am not in the habit of using vaccines for the various inflammatory conditions in the upper air tract.

So far I have dealt almost entirely with nasal conditions, but the underlying principles are the same for the pharynx and the larynx. I will only briefly refer to some of the common local pathologic changes and tell you in a few words what my therapeutic armamentarium contains.

Adenoids, when producing persistent disabilities, such as defective nasal drainage, obstruction in breathing, aural inflammation or possibly septic process, are treated quite properly by surgical measures. Young children, however, may have occasional attacks of adenoiditis in which surgery is not advisable; correction of dietetic errors, lessening the amount of coddling may alone suffice. A small amount of argyrol, say 5 per cent, instilled into the nose, or the use of iodin in oil may remove the symptoms present, and the little lymphoid tissue present may be left to carry out whatever physiologic functions nature intended it should. Syrup of the iodid of iron internally is also of use. If menthol is used, the strength should not be more than a grain to the ounce, as it is very irritating in the young and old.

In adults, owing to probably repeated inflammatory states or to the dietetic and faulty habit errors so largely associated with chronic pharyngitis, irregular fibrosis may take place, and we have what is known broadly as chronic nasopharyngitis. Correction of the general systemic faults is sine qua non of the treatment. Toxemia of diabetes, chronic kidney, liver and intestinal origin, must be always in mind in adults. Locally, however, in the acute exacerbations of the condition, salts of silver (argyrol, protargol, etc.), or mild solutions of zinc chlorid seem to act very well. Postnasal applications vigorously applied usually clear up the condition. In the chronic state,

when the mucosa is soggy, massage of the vault with a gauze covered finger gives marked relief. I am in the habit of giving my patients a postnasal applicator and with a handmirror show them how they can paint their own nasopharynx. Tannic acid, grs. 40 to the ounce of glycerin, is the usual pigment employed. Self painting has the added advantage of lessening the hypersensitiveness of the pharynx so often present, so that the presence of mucus does not excite the same amount of discomfort. When there is a cleft in the nasopharynx, probably in the center of the preexisting adenoid mass, spoken of as the remains of the pouch of Rathke, if a crust or oyster shell secretion forms, I am sorry to say I offer no therapeutic remedy of much use. Cleansing the nose with an alkaline lotion or giving the patient a postnasal tip with many perforations to attach to a syringe or douche lessens the discomfort. It must not be forgotten that seepage from a posterior nasal air cell may be responsible for the mucopurulent film covering the vault.

The use of iodin, as in Mandle's pigment, is very generally in use as a postnasal application. When the membrane is atrophic in type it will increase secretion and lessen the discomfort, but surely it is not rational to use it in a hyper-secreting mucosa. Unnecessary zeal in clearing the nasopharynx of its adenoid tissue will in after years lead to a dry glazed membrane.

The remainder of the pharynx may be described as a sac suspended from the base of the cranium, having an opening in front and below. Its walls are composed of muscle and fibrous tissue, and interspersed in its envelope are various groups of lymph nodules, while covering its external surface is mucous membrane. Various areas may bear the brunt of inflammatory reaction, then we may have inflammation of the mucous membrane of the muscles, lymphoid tissue or fibrous tissue. In general, systemic treatment is the same as for similar conditions elsewhere, such as the use of heat, rest and such drugs as sodium salicylate, guaiacol, aspirin, etc. Locally, however, we may do much more, for example, when the faucial tonsils are acutely inflamed. I am in the habit of using, in the early stages, a strong solution of silver nitrate, 100 grs. to the ounce. The gland is dried with cotton wool and the sur-

face is turned white. This relieves the pain, and if used very early materially lessens the severity of the attack. Probing the crypts or cupping the tonsil, too, may be of service. Hot saline irrigations are comforting to all inflammatory pharyngeal conditions. Gargling is usually imperfectly performed, and spraying is of little avail. Painting the throat with iodin and glycerin is an old standby, but I have never used it. Many of those conditions of acute inflammation are rapidly succeeded by general bodily infection, and it is to this aspect of the case that careful oversight should be given. For example, an acute tonsillitis in the young may and often does cause carditis, only to be suspected by persistent increase of the pulse, and it is a good rule to follow, to keep patients in bed until the pulse rate remains within the normal limits. Acute pharyngeal inflammation may indicate some specific infection, such as syphilis, or the exanthemata, or diphtheria. Vincent's angina, too, should be kept in mind, and when ulceration occurs, difficulties will at times arise to exclude syphilis. The Vincent ulcer responds best, I think, to the use of 5 or 10 per cent of copper.

Acute streptococcal angina is sometimes spoken of as erysipelas of the throat, and causes grave anxiety lest the airway may be impeded by severe edema at the entrance of the larynx. Rapid involvement of the deep tissues in the neck adds gravity to the outlook—one must remember that in these patients death ensues from cardiac failure, hence the importance of heart stimulants at the proper time. Digitalis is of great value, but its effect does not come into use before 12 or 18 hours. The use of poultices seems to be dying out, but I am old fashioned enough to see much virtue in the linseed poultice.

Most chronic inflammatory changes in the pharyngeal mucosa depend on dietetic and bowel errors. Local pigments are used much too often; alcohol and tobacco not reduced or interdicted often enough. Relief of the worry and fear many of these patients have will oftentimes allow of their disregarding most of the little discomforts they have. A remedy I often use in chronic pharyngeal discomfort is *ulmi fulvae* (slippery elm). Dispensed with a small amount of acid carbolic or menthol, they give considerable comfort. Menthol in licorice, too,

is useful. Solutions of alum and zinc chlorid and krameria might be more often used with advantage. A spare, simple diet with regular use of blue pill and salts is better than local treatment. Pale anemic girls with small lymphoid nodules on the posterior wall of the pharynx require iron and not a local applicator.

Chronic tonsil inflammation, which one must remember may be the seat of a very general pharyngeal discomfort, responds only in my experience to surgical measures.

I do not use the X-ray in tonsil hyperplasia or inflammation. Hyperplasia of the tonsil may respond to dental and mouth hygiene.

Massage to the front and side of the neck is not nearly as often used as it should be. It is of special value in myositis of the sternomastoid and fibrositis of the pharyngeal aponeurosis.

**The Larynx.**—The larynx is a cartilaginous box containing many delicate muscles and small joints, some fibrous tissue, and, in the saccule, a considerable glandular secreting area. The lining mucosa is delicate, and only in certain areas, like the arytenoid covering, is there much likelihood of some serous distention. Serious disease may originate in its own tissue, descend from the pharynx above, the esophagus behind, the thyroid in front, or from the lungs below. Generally speaking, the chief symptom is hoarseness. Time permits me only to speak of a few therapeutic measures.

Acute laryngitis does not permit of topical applications, for trauma is not an aid. We are left then with such simple measures as inhalations of medicated steam, hot or cold applications to the neck, measures to check excessive cough and assist the liquefying of the secretions of the upper respiratory tree. General evacuation by the bowels, kidney and skin, with vocal rest are obviously of value. When the joints are involved the latter is particularly to be enjoined. Acute nephritis may be the cause of an acute laryngitis. Chronic laryngitis may require topical treatment, local applications of zinc chlorid or some silver salt; tubercular disease, vocal rest or the cautery point. Faulty voice production requires correction, and this also includes misuse, such as excessively violent use, or under poor atmospheric conditions. Excessive mucous secretion may

be caused by overaction of the mucous glands in the saccule or dry crustings may lead one to see the association between a chronic sinusitis or atrophic rhinitis. The use of a self injector for the application of various oily solutions to the laryngeal mucosa is a very efficient form of treatment. Acute and chronic laryngitis, when accompanied by tracheal involvement with intractable cough, responds very often marvelously well to intratracheal injections of a 2 per cent solution of menthol in oil.

Hoarseness due to paralysis is treated solely on medical lines. Reference might be made to central lesions due to specific disease, or what is termed arteriosclerosis, tabes, aneurism, apical pleurisy, cardiac and excessive venous distention, from such conditions as cirrhosis of the liver. Peripheral neuritis, due to influenza or the toxins of diphtheria, is not infrequent. Hence the use of strychnin, electricity and massage may be helpful. Local hyperplasia of mucosa may require a cauterizing agent. Radium or X-ray may be used in multiple papilloma, and pachyderma sometimes responds to salicylic acid in alcohol. Persistent hoarseness in a patient over thirty demands the exclusion of cancer.

The Esophagus.—Very little in the way of medical treatment is used in this portion of the digestive tract. It lends itself more to care by surgical measures. At any rate, whatever local treatment may be desirable must be associated with a very formidable surgical procedure.

I have already gone beyond the reasonable limits to which one should confine himself in a symposium. I have left out much that the discussion can readily supply. In the management of chronic ailments one is always impressed with the knowledge that a functional element often becomes the dominating feature of the complaint. We must be careful not to irritate or help keep up this condition. One of the greatest weapons we possess in the treatment of diseases is our ability to increase the faith, hope and pluck of our patients.

Increase in our reading of general medicine and the acquisition of greater knowledge of the underlying process of disordered metabolism will strengthen our specialty in its aim to be an art and a great aid in the treatment of disease.

LII.

THE NONSURGICAL TREATMENT OF EAR, NOSE  
AND THROAT DISEASES.\*

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BOSTON.

The one great outstanding problem in the otologic world today is the problem of the treatment of chronic deafness. There is no better evidence of this than the fact that it occupies such a prominent part in the program of this meeting.

In the short time allotted to me, I desire to speak particularly of the nonsurgical treatment of the two great causes of deafness, viz., chronic suppurative and chronic nonsuppurative inflammation of the middle ear.

First, in regard to the chronic suppurative type, the easiest advice to give a patient who consults an aurist for a chronic discharge from the ear is to advise surgical measures, but unless one suspects some serious complication, a prolonged middle ear treatment is advisable, and it is justified by the results often obtained. My remarks may seem very elementary, but I hope they may give someone courage to continue his endeavors to mitigate the suffering from such a handicap as deafness.

Of first importance in advising treatment and in giving a prognosis is to determine whether the discharge is entirely aural, or whether it is possibly influenced by nasopharyngeal conditions. If the discharge is odorless and tenacious, it is probably tubal and the prognosis is good. If, on the contrary, it is offensive, thick and yellow, an osteitis is present, and the outlook is poor. The location of the perforation is important. If it is in the anterior segment only, it is probably kept open by tubal discharge and not from an infection of the middle ear itself. In any case, first examine the nasopharynx, the

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sinuses, antra, etc., and be sure there is no cause for irritation from any of these sources. A very slight hypertrophy of the lymphoid tissue in the nasopharynx, or a tooth causing a discharging antrum, may render all local treatment of the ear futile. The care of a discharging ear is very uninteresting, and I wonder if we see our patients often enough and give the ears the careful cleansing they deserve? The ear should be kept as dry as possible, using no water or very little. If douching is to be carried out for a long time, salt solution has always seemed preferable. Cleanse with peroxid of hydrogen, then dry, and I still use the time honored solution of alcohol and boric acid. Granulations are controlled by caustics and the middle ear syringe is used whenever the perforation allows. It is well after a prolonged use of the alcohol solution to stop and, after dry cleansing, blow dry boric acid powder plentifully in the middle ear cavity. It is surprising how often ears which have discharged for years will respond to this treatment. Dr. Campbell Smyth is of the opinion that the improvement in certain cases after the alcohol treatment is due to the elimination of a growth of aspergillus in the middle ear and that true osteitis does not always exist. He may be right, as I have seen obstinate cases of eczema of the canal and the drum, where I did not suspect any fungous infection, relieved within twenty-four hours after using alcohol. The use of ether instillations has not been successful in my hands. I have not tried the various coal tar preparations, nor do I know anything personally as to the merits of ionization, as suggested by Warwick. Instruct the patient as to home treatment. Show him how to wind toothpicks, dry the ear, and use the medication desired. If after a prolonged care, there is no improvement, or if the X-ray shows cholesteatoma in the antrum and mastoid, then we must resort to surgical measures. Just remember, in cases where both ears are discharging and there is fair hearing, that it is sometimes preferable to continue treatment rather than to advise surgical measures which may result in a more serious handicap, as far as the patient's earning capacity is concerned.

What can we do for those cases where we have been fortunate enough to obtain a permanently dry middle ear, or the cases which come to us for deafness due to previous sup-

puration? We may have to deal either with a thin scar, which has no tension and soon becomes relaxed, or to deal with various sized perforations. In the first instance, we must pay particular attention to the nasopharynx to insure a normally acting eustachian tube, so the cicatrix will suffice for a drum as long as possible. If there is relaxation, then the use of contractile collodion or the paper splint will often give a marked clearness to the voice which cannot be obtained in any other way. I realize that a great many aurists think that this fussing with paper discs, etc., amounts to nothing, but they must not forget that a very slight increase in clearness of borderland tones makes all the difference in the world to the hard of hearing person. The hearing in cases of perforations can often be increased either by the paper patch or the use of the cotton drum. All these cases require patience upon the part of the otologist, but the results obtained are very worth while.

Secondly, what can be done for the purely nonsuppurative patient who consults one for deafness? Will the time ever come when we can test the hearing accurately and easily, and prescribe an inconspicuous instrument for the individual case? Will there then be otologists and "audiometrists"? Possibly! It seems to me that for the present we may divide the non-suppurative cases into three groups, the hypertrophic, the atrophic, and otosclerotic.

Let us consider the hypertrophic forms of deafness. There are two important factors as to the cause of this form, and they cannot be separated, viz., a derangement of the mechanical transmission of sound due to obstructive lesions in the nasopharynx, etc., and secondly, due to the absorption of toxic bacterial products from local foci and the gastrointestinal tract. The local nonsurgical treatment of obstructive conditions of the nasopharynx consists in local depletion by the use of various astringents and mild caustics. The normal patency of the tube must be restored. This can be done for a short time by the use of inflation, but unless the cause of the obstruction be removed inflation is of little permanent use. I still deplore the unintelligent use of inflation and insist that the conditions necessitating inflation must be taken into con-

sideration first of all. A recent paper by Kerrison mentions the theory that relaxation of the drum membrane is a very important factor in the causation of deafness. Dr. Blake, a number of years ago, observed this, and I myself have spoken of the importance of preserving as much of the accommodation of the sound conducting mechanism as is possible, and that forcible inflation, enough to distend the drum, does more harm than good. I still believe in the use of medicated bougies in this form of deafness. A solution of neosilvol or some other organic silver preparation, blown into the tube through the catheter after the passing of a bougie, is very much worth while. The care of the toxic conditions which are so common in almost every case of deafness is unfortunately out of place among the nonsurgical phases. The attention to general health, particularly the relief of constipation, exercise, the hygiene of the patient's life, must be considered seriously, if one is to accomplish results.

In the atrophic form, there is generally a patent tube, and the damage has been done. There is an arthritic condition of the ossicular joints and a fixation of the stapes, and treatment can do no more than stay the process, if that.

Otosclerosis! What shall we do with these unfortunate people? Here we have a patent tube and a negative examination in every way, as far as the otologist is concerned. It seems as if we must refer such cases to other specialists. We know from the reports of Drury, Lawrence and others that the endocrines do play an important part. Out of the few cases which I have referred to the Evans Memorial for tests, two or three have improved. It is certainly our duty, when we have ascertained that a given patient has otosclerosis, not to continue local treatment for an interminable time but to give the patient the benefit of every known avenue of assistance.

Concerning tinnitus, do not forget that while tinnitus is often of aural origin, the primary cause may be far removed from the ear. Blood pressure, the anemias, leukemia, and again toxic foci, especially the teeth, must be eliminated. The use of the violet ray in certain cases gives either complete relief or lessens this distressing symptom.

The use of the various mechanical aids to hearing is rapidly increasing. The radio is a great factor in rehabilitating

a disused ear. Give the patient the opportunity of obtaining relief from a life of silence.

Before closing this short talk, I must call your attention to the fact that a large percentage of cases of vertigo are of toxic origin. Here again teeth, tonsils and gastrointestinal disorders are generally the primary causes. Toxic absorption with normal ears will not cause vertigo, and contra, a non-suppurative pathologic ear, with no toxic absorption, will not cause vertigo, but the combination of the two is necessary to cause the complex. Elimination of these foci will reduce the necessity of removal of the stapes or surgical measures.

LIII.

THE NEWER METHODS OF INTRAVENOUS THERAPY IN SEPTICEMIAS OF OTITIC ORIGIN  
(A PRELIMINARY REPORT).\*

By C. T. PORTER, M. D.,

BOSTON.

Reading in the Johns Hopkins Journal of 1924, of the intravenous use of mercurochrome sol. 220, in a case of localized abscess (perinephritic), I was struck with the possibilities of such treatment in the field of otology, particularly in cases of general septicemia following thrombosis of the lateral sinus.

It would seem that the otologists had an advantage over the general surgeon in treating septicemia by being able to eliminate the original source of infection by ligation of the jugular. Moreover, it occurred to me that here was a valuable agent in treating the generally septic cases where there is no evidence of a definite sinus thrombosis, as in case No. 2.

Since coming to this decision, I have had the opportunity to put it to test in a number of cases and have been most gratified with the results.

The full dosage in man is about 5 mg. per kilo of body weight. In cases with an unusually large number of organisms free in the circulation, I have preferred to give a smaller dose (about 3 mg. per kilo of body weight). I have made the reduction in dosage because I am convinced that the reaction so much dreaded by those using the drug is caused not by the mercurochrome but by the liberation of the toxins from the killed bacteria in the circulation. I have repeated the dose and increased or decreased the amount, according to the initial reactions, which show wide variations.

That there is some danger in the use of mercurochrome intravenously is unquestionably true, especially in cases where

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there is kidney involvement. There have been reported some cases where an acute nephritis has occurred when no previous kidney lesion existed. It is unwise to repeat the injection until this has quieted down. There are on record a few fatalities from complete suppression of urine following a severe reaction. In only one instance have I noted kidney involvement, a slight trace of albumin, which quickly disappeared.

The following are reports of three cases in which mercurochrome was used with apparent beneficial results

Case No. 1.—Male, white, age 25. April 4, 1924, admitted to hospital. Diagnosis: Left acute suppurative otitis media with mastoiditis. Perisinus abscess? Thrombosis. History: March 7, 1924, sore throat with pain in left ear; in bed two days. Drum ruptured and discharged.

March 10, 1924. Patient allowed to return to work. Ear still discharging. Worked one week. Then had to quit and go to bed. Seen by local doctor and throat man.

March 30, 1924. Again complained of pain in left ear. Following day had chill, and had chill and temperature 105 F. daily until admitted to hospital.

April 4, 1924. Operation: Left simple mastoid. Perisinus abscess found, sinus wall thickened, thrombosed. Condition very poor. Jugular vein not tied at this time for that reason.

April 5, 1924. Left jugular ligated, vein opened in mastoid, pus in vein. Culture pneumococcus.

April 8, 1924. Temperature still swinging from 100 to 104. Mercurochrome, 20 cc., intravenously. Sharp reaction. Chill, temperature 105 F. Violent diarrhea, 20 stools in 24 hours, tinged red. Urine also tinged. Temperature down two days. Up on third day.

April 11, 1924. Mercurochrome, 18 cc., given, with fall in temperature. Temperature 98 to 100 for six days, then rose to 101 to 102. Then neck wound opened and small amount of pus evacuated, following which temperature dropped to normal and remained normal until patient was discharged, well, April 29, 1924.

Case No. 2.—C. E., age 4, white, female. Admitted May 9, 1924. History: Tonsillitis five weeks ago. Pain and discharge A. D., four weeks (spontaneous rupture). Temperature for four days with swelling behind A. D.

May 20, 1924. Operation: Right simple mastoidectomy. Sinus exposed, large perisinus abscess with granulations on sinus and adjacent dura.

May 25, 1924. Wick removed. Middle ear still discharging.

June 4, 1924. Still discharge from middle ear. Mercurochrome, 4 per cent, used locally.

June 9, 1924. Operation: Adenoidectomy and paracentesis for left otitis media suppurativa acuta.

June 10, 1924. Child delirious. Physical examination negative, except for systolic murmur at apex and axilla.

June 11, 1924. Operation: Left simple mastoidectomy. Mastoid broken down and filled with pus and granulations. Sinus and dura not exposed.

June 12, 1924. Temperature still remains up. Patient has several infected hangnails and seems generally septic. Mercurochrome, 1 per cent, 5 cc., in median cephalic vein, right arm. Slight rise in temperature, no chill. Temperature dropped then from 103-104 to 100-101 F., where it remained for two days.

June 14, 1924. Above dose repeated. Temperature dropped to normal and remained so.

June 15, 1924. Temperature down. Right mastoid wound closing up. Right middle ear almost dry. The left shows very little tendency to heal. Temperature still down.

June 23, 1924. Right mastoid and middle ear almost healed. Left is beginning to heal in. Temperature still down.

June 28, 1924. Discharged to Out Patient Department against advice. Right middle ear dry. Wound clean and healing. Left ear still has slight discharge from middle ear. Post wound healing. Temperature normal.

Case No. 3.—H. H., age 9, white, female.

May 14, 1924. Admitted to Massachusetts Eye and Ear Infirmary. Diagnosis: Left postaural abscess, seven days. Right otitis media suppurativa acuta, seven days. History: Both ears discharged two and a half years ago. Two weeks ago patient had severe cold and sore throat with earache left side.

May 15, 1924. Operation: Left simple mastoid. Sinus exposed and appeared normal.

May 25, 1924. Middle ear dry.

June 1, 1924. Patient running temperature. Heart and lungs negative. General condition poor. Left middle ear dry. Right ear still discharging.

June 19, 1924. Operation: Right simple mastoid. Sinus and dura not exposed. Tonsillectomy and adenoidectomy, LaForce. Left mastoid wound cleaned out and edges sutured.

June 21, 1924. Physical examination: Heart and lungs clear. P. E. negative except for hyperemia around right eye. Erysipelas (?).

June 22, 1924. Mercurochrome, 1 per cent, 3 cc., intravenously. Slight rise in temperature, no diarrhea. Temperature gradually came down to normal on June 26th. Transferred to Observation Ward. Erysipelas (?).

July 2, 1924. Transferred back to house, running septic temperature.

July 5, 1924. Still running septic temperature; white corpuscles, 16,200. Unable to get blood culture.

July 10, 1924. Blood culture taken. White corpuscles, 16,200.

July 13, 1924. Culture shows short chain streptococci. Patient still running temperature. White corpuscles, 18,200. Tenderness and swelling of right knee.

July 15, 1924. Mercurochrome, 1 per cent, 5 cc., intravenously. Some reaction, chill, temperature 104 F. No diarrhea or other discomfort. Transferred to Massachusetts General Hospital, surgical service, on account of septic arthritis, right knee.

July 18, 1924. Chart shows temperature 100-104 F. daily. No chills but chilly sensations. Knee aspirated. No organisms.

July 24, 1924. Appearance of mastoid wounds poor. Patient transferred back to Massachusetts Eye and Ear Infirmary. Temperature 100-103 F.

July 27, 1924. Mercurochrome, 1 per cent, 5 cc., intravenously. Slight chill, with rise of temperature to 102 F., rapidly falling to normal.

July 31, 1924. Temperature normal for three days. Wounds healthy.

August 6, 1924. Temperature normal. Wounds practically healed. Discharged home. Middle ears dry.

LIV.

THE INFLUENCE OF CLIMATE IN THE NONSURGI-  
CAL TREATMENT OF EAR, NOSE AND  
THROAT INFECTIONS.\*

BY FRANCIS P. EMERSON, M. D.,  
BOSTON.

It seems to be generally accepted that at times patients are benefited by a change of climate. It is unfortunate, however, that the statistical information as to what climate is best adapted to a definite pathologic condition, and where it is to be found, is not available for scientific discussion. So many side issues, which have an important bearing on the subject, have to be taken into consideration in forming a decision that our conclusion must be indefinite and a matter of opinion. In a general way, we must advise a climate where the extremes of temperature are not marked, where the humidity is low, and where there is a maximum of sunlight. In addition, we have to consider the prevalence of high winds, dust storms, and the facilities for housing, etc. The distance from home, and the question of the patient's becoming acclimated to an environment totally different from that to which he or she has been accustomed, must also be considered in individual cases. Even when patients are benefited by a radical change of environment, there is a question of whether this is due entirely to climatic changes and the open, out of door life, or whether it may not, in part at least, be due to a change in habits, both mental and physical. If, as the result of a proper climatic environment, any diseased processes were modified, or cured, they should be those with mucous membrane infections, as these would be brought directly into contact with the healing atmosphere.

The attempt to find out, through Boards of Health, the relative prevalence of diseases of the ear, nose and throat, in

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different parts of the world, was unsuccessful, for here we had to consider, besides the climate, the effect of the infectious diseases and the degree to which they prevailed in a given locality. A semitropical climate, where the question of artificial heat in the houses can be eliminated, and where life is spent in the open, with plenty of physical exercise and a maximum of sunshine, would seem to be ideal; but here all these desirable factors may be offset by the infectious diseases, the rainy season, or the prevalence of high winds, so that statistical information would be unreliable.

In attempting to define just what pathologic conditions of the mucous membrane we would expect to improve by a change of climate, we have first to consider the acute or subacute infections involving the mucous membrane only. For acute infections, the most desirable climate is one that is not subject to wide variations of temperature, that has some altitude—i. e., not one at the sea level, and which is in a locality with plenty of sunshine, where the patient can spend the most hours out of doors. Indeed, those of us at the sea level know that if a patient with a subacute infection which does not tend to undergo resolution, removes for a short time to a higher altitude not many miles away, there will often be a change in the bacterial flora within a few days, and such a patient will overcome the infection. Now, while the bacterial flora will change in a few days for the patient who has been living at some distance, it will fail to have the same good effect in acute infections contracted after the patient has become accustomed to his environment, although the infection may clear up in a shorter time than it would at the sea level.

The foregoing remarks apply to acute infections involving the mucosa, and we now have to consider the effect of climate in a chronic infection where the submucosa is involved and the drainage from the bony cavities has been seriously impaired. Here, a favorable environment will do much to improve the patient's resistance, and prevent sudden swelling of the soft tissues that further interferes with the ventilation and drainage of the sinuses; but it will not clear up a deep seated infection in the lymphoid tissue or restore the function of an organ when it has once been lost. In other words, any

case of disease of the ear, nose or throat, in which there is a chronic infection requiring surgical interference for its cure at the sea level, will not escape operation by a change of climate.

#### SUMMARY.

We can expect, then, in a properly selected climate, marked benefit in all functional disorders, and in cases in which the infection is confined to the mucosa. It is also a valuable adjunct in the treatment of those cases in which the deeper structures are involved.

LV.

THE RELATION OF DIET TO THE NONSURGICAL  
TREATMENT OF DISEASES OF THE EAR,  
NOSE AND THROAT.\*

By D. C. JARVIS, M. D.,

BARRE, VERMONT.

INTRODUCTION.

In undertaking research work of a medical nature, it seems advisable to formulate fundamentals to serve as a basis for bringing to light and solving problems. Without fundamentals it is so easy to leave the main highway of work and start detours which require sometimes almost a lifetime of work to complete. Up in the country one lives close to Nature, and it is most natural that her fundamentals be adopted when undertaking medical research. These fundamentals, we know, are ages old and have stood the test of time. If any of you reading this follow gardening as a hobby, you realize that any flower, whether grown successfully upon vine, plant or bush, requires for its successful growth the observance of certain fundamentals, which one may enumerate somewhat as follows: There must be suitable soil, there must be suitable preparation of the soil, there must be seed of sufficient germinating power or root of sufficient strength, a certain amount of moisture, a certain amount of heat and the soil at rest after preparation and planting. As one observes the laboratory worker one notes that he observes these fundamentals of nature, for he seems to select suitable culture media. This culture media must be suitably prepared, the microorganisms being dealt with must have sufficient virulence. He takes into consideration a certain amount of moisture, he provides for a

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certain amount of heat, and after the microorganisms have been added to the culture media the culture media is placed at rest.

#### OTHER OBSERVATIONS.

If one follows gardening as a hobby one becomes very much interested in Mendel's law as a basis for growing flowers for flower shows. One also becomes keenly interested in plant foods as a means of growing flowers of unusual excellence. Out in the garden one strives to do various things with sweet peas, as Mendel did, and while working with plants notes that members of the vegetable kingdom require animal food for their best growth, and many members of the animal kingdom require vegetable food for their best growth. One sees in one's flowers the results of the various plant foods used. Soot added to the soil makes the darker shades of sweet peas darker, while lime water added to the soil makes the delicate shades more delicate. One realizes that plants and animals (man included) are propagated from seed, and one wonders if the same fundamentals, observations, deductions and conclusions may not apply to both.

#### OBSERVATIONS CONNECTED WITH THE GRANITE INDUSTRY.

As one turns to an investigation of the granite cutting industry, the first fundamental to claim one's attention is suitable soil. One realizes that all men entering the industry are not affected alike by granite dust inhalation, and so one endeavors to determine whether individuals breaking down early from granite dust inhalation represent a different type of soil than those surviving a long service in the industry. As a result of a great deal of work done, it was discovered that an individual was susceptible to the early ill effects of granite dust inhalation in proportion to the amount of lymphoid tissue in the upper respiratory tract. Lymphoid tissue seemed to represent suitable soil. The question then arose as to why some individuals had more lymphoid tissue in the upper respiratory tract than others, and in an effort to answer this question our next fundamental suitable preparation of the soil was utilized. In trying to answer this question, it was realized that we were dealing with three environments, namely, a respiratory environment, a dietetic environment and a

muscular or physical environment. By reason of work done, it was possible to rule out the respiratory environment as a causal factor, and so the diet of 500 granite cutters, representing ten different nationalities, was analyzed and the results checked up with the examination of the nose and throat. As a result of this work, it seemed possible to conclude that lymphoid tissue was present in the upper respiratory tract in proportion as fats were absent from the diet. In order to check this observation up further, the upper respiratory tract of about a hundred students in a college preparatory school was examined and the amount of lymphoid tissue checked up with the diet, with no change in the conclusion following an analysis of the diet of 500 granite cutters. In checking this observation up from another angle, men who were clinically ill, following granite dust inhalation, were given olive oil in varying amounts and fats generally, added to their diet, with the result that one was able to observe a subsidence of cough and expectoration and a gain in weight in early cases without additional treatment.

#### FURTHER NOSE AND THROAT OBSERVATIONS.

Following the observations such as those just mentioned, it was most natural that one add fats to the diet of patients showing an increased amount of lymphoid tissue in the upper respiratory tract. After the examination of a nose and throat, one fell into the habit of asking the patient the different foods representing the various meals of the day, and, before long, from an examination of the nose and throat, one began to anticipate the patient's statements with reference to the food taken, and still later, following the nose and throat examination, one began to outline to the patient with some degree of confidence the daily diet. With the passing of time one began to arrange one's observations, and after four years they seem to have settled into the following arrangement. Ruling out acute conditions of the nose and throat, which so many times seem to be the result of an effort on the part of the upper respiratory tract to adapt itself to sudden changes in respiratory environment, and ruling out conditions which are dependent upon some local condition, such as a sinus involvement, the following is noted:

1. There seems to be an increase in size and redness of the turbinates and a subacute laryngitis when there is an excess of sweets in the diet. Why the nasopharynx and pharynx are skipped I do not know.

2. There seems to be a catarrhal discharge from the nose and throat, such as we often meet with in cases of impaired hearing when there is a lack of the proper amount of vegetables in the diet.

3. There seems to be a granular condition of the posterior pharyngeal wall when there is an excess in the diet of foods made from flour, such as bread, pastries, etc.

4. There seems to be an increase in the amount of lymphoid tissue when there is a lack of the proper amount of fats in the diet.

Of course, these observations would be of no avail unless a change in the diet brought about a change in the condition in the nose and throat. The question then naturally arises as to the length of time necessary before one sees results in the upper respiratory tract. The answer seems to be that from ten days to two weeks are required. Returning to our fundamentals, one wonders if inheritance plus diet does not represent suitable soil, and the inability of the upper respiratory tract to adapt itself to sudden changes in respiratory environment does not represent suitable preparation of the soil. With these two fundamentals fulfilled in the individual, may not the growth of microorganisms be possible?

Up in the country all alone, one misses the guidance and counsel of men older in one's chosen specialty, and so clings to fundamentals, trusting to time to show one whether one's conclusions are correct, being content in the meantime to learn to labor and to wait.

## LVI.

### ROENTGEN RAY THERAPY IN THE NONSURGICAL TREATMENT OF EAR, NOSE AND THROAT DISEASES.\*

BY D. C. JARVIS, M. D.,  
BARRE, VERMONT.

#### INTRODUCTION.

In participating in a symposium of this kind, one wonders how one may correlate roentgen ray therapy with the other methods of nonsurgical treatment of ear, nose and throat diseases which have been outlined. Is it possible that there are certain fundamentals underlying successful treatment of these conditions, and in proportion as one observes these fundamentals in like proportion is one able to secure results, no matter what therapeutic agent is employed? Many of the methods that have been outlined are possible of application by all, but with roentgen ray therapy there are one or two handicaps to be considered. First of all, there is the expense of the apparatus, and second, the time necessary to learn its care and operation. Granting that these handicaps are readily overcome, the question then arises as to whether experience with this form of treatment warrants its continuance, and if its continuance is warranted, what position is it to occupy among therapeutic measures? Is it to be considered a measure of primary importance, a measure of secondary importance, or a measure to be employed only when all other measures have failed?

#### OBSERVATIONS.

My own experience with roentgen ray therapy in diseases of the ear, nose and throat dates back to 1921. At that time the National Tuberculosis Association, through its Commit-

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tee on Mortality from Tuberculosis in the Dusty Trades, was investigating the granite cutting industry, as represented by the granite cutting plants of Barre, Vermont, and I happened to have local charge of the committee's work during the life of the investigation. It had been discovered that an individual was susceptible to the ill effects of granite dust inhalation in proportion to the amount of lymphoid tissue present in the upper respiratory tract, and roentgen ray therapy was utilized in an effort to determine, if possible, just how much one could influence lymphoid tissue of the upper respiratory tract by means of this agent. As a part of the observations made during the summer of 1921, a patient about forty years of age was treated for an enlarged lingual tonsil by means of the roentgen rays, the technic used being that recommended by Witherbee, namely, a seven-inch spark gap, 5 ma., 10-inch distance, with the exception that a two-minute exposure time was used. One week later the patient returned to the office and volunteered the statement that the right ear, which had been stuffy for ten years, was now clear, and hearing seemed to be improved. No particular importance was attached to this statement at the time, because interest centered around the effect of roentgen ray therapy on lymphoid tissue, but one month later, having a patient who at varying intervals had appeared at the office for inflations of both ears by means of the eustachian catheter and not succeeding in readily restoring the hearing by means of the usual inflations, a trial of the roentgen rays was suggested, the area exposed for treatment being that recommended by Witherbee when treating tonsils. Two days later the patient, who was the proprietor of a general store in an adjoining town, returned to the office and stated that his hearing had been restored, his ears were now clear and he experienced no difficulty in hearing while waiting on customers. From this statement interest was aroused in this subject.

TYPE OF PATIENT IN WHOM ROENTGEN RAY THERAPY PRODUCED  
SUBJECTIVE RESULTS.

As cases were treated it became apparent that all patients complaining of impaired hearing were not benefited by the use of the roentgen ray. It was soon realized that this form

of treatment was applicable only to certain types of cases, and so an effort was made to discover, if possible, the type of case in which the use of the roentgen ray might be expected to bring about improvement. As one thinks over the patients complaining of impaired hearing coming to one's office they seem, in Northern New England at least, to fall into three groups. The first group seems to include children and young adults, in whom impaired hearing is so often explained by the presence in the nasopharynx of a mass of adenoid tissue. The second group seems to include adults between the ages of thirty and fifty, who are subject to frequent head colds, and complain more or less of a constant catarrhal discharge from the throat and at times a stuffiness in the ears, with the accompanying impairment of hearing. Patients of this group seem to appear at one's office at varying intervals for inflations of the ears and oftentimes emphasize the annoyance occasioned by the presence of head noises. The third group seems to include patients advanced in years, in whom the impaired hearing represents the outstanding symptom, less emphasis being placed on the throat symptoms. As one thinks over these groups, the outstanding feature of the first is impaired nasal respiration; of the second, the prominent throat element of the case, and of the third, simply impaired hearing. As observations were continued, it became apparent that the type of patient represented by group 2 was the type in which one might expect results from the use of the roentgen ray. As patients of this group were studied more at length, it was observed that many times the turbinates were increased in size, that lymphoid nodules were present on the posterior pharyngeal wall and oftentimes a prominent band of lymphoid tissue running up either side of the pharynx just posterior to the posterior tonsillar pillar. In describing the type of patient in which one may expect results from the use of the roentgen ray, you will notice a condition of the upper respiratory tract is described as an indication for treatment rather than an aural condition. If observations such as these are possible, the question naturally arises in one's mind as to what it is that makes such observations possible. What underlying fundamental truth are we dealing with when we influence certain conditions of the ear, nose and throat by means of the

roentgen rays? Do we influence suitable soil by means of roentgen ray therapy? Do we influence suitable preparation of the soil, or do we destroy existing microorganisms?

#### SUITABLE SOIL.

If one cares to consider whether we influence suitable soil then one has to decide whether we influence lymphoid tissue, for lymphoid tissue seems to represent suitable soil. At once there comes to mind all the experience of the past with reference to the effect of roentgen ray therapy upon enlarged cervical lymph nodes. In times past we thought we influenced the enlarged cervical lymph node directly by means of the roentgen ray, but with the passing of time and the focusing of attention more and more on the tonsil, it has been thought we influenced the tonsil primarily and the enlarged cervical lymph node secondarily. In the lungs, Krause has shown that the behavior of a lymph node is dependent upon the behavior of the lesion external to it. But one wonders whether we have not jumped at conclusions when we conclude that we influence lymphoid tissue primarily by means of roentgen ray therapy. Lederer, reporting from Beck's clinic, seems to show no marked reduction in size of tonsils occurs following the use of the roentgen rays, and Babcock, in a later report, in which he includes some of Coakley's cases, seems to show conclusively, by means of pathologic studies, that an abundance of lymphoid tissue exists in tonsils treated by the roentgen rays. My own observations, undertaken as a part of the investigation rather than with any thought of supplanting tonsillectomy with roentgen ray therapy, seem to lead one to expect very little reduction in size of tonsils from the use of roentgen rays. In the series of cases observed, in only one case, and then in only one tonsil, did it seem possible to enter upon the record that a reduction in size had taken place. A study of the evidence at hand tends to lead one to conclude that primarily we do not influence suitable soil by means of roentgen ray therapy.

#### DESTRUCTION OF EXISTING MICROORGANISMS.

If one cares to consider whether we destroy existing microorganisms, then there are a number of pieces of evidence de-

serving consideration. Two years ago, while spending ten days with Dr. Kennon Dunham of Cincinnati, Ohio, looking over his pathologic and roentgenologic work on diseases of the chest, the subject of roentgen ray therapy and lymphoid tissue came up, during the course of conversation, and he called my attention to an article of his printed in the May, 1916, number of the American Journal of Roentgenology, on the treatment of carbuncle by means of the roentgen rays. It seems possible to so influence the course of a carbuncle that it soon ceases to be painful, and the infected part can be moved without distress. This same treatment is also applicable to palmar abscess of the streptococcal type. In these two instances it would not appear that we are securing results from any effect of the roentgen rays on lymphoid tissue, but rather from a destruction of existing microorganisms. The work of Dr. Preston M. Hickey of Detroit on diphtheria carriers also deserves consideration. His work may be summarized as follows:

In untreated cases of diphtheria carriers there were 34 per cent of spontaneous cures; cases treated with mercurochrome, 68 per cent of cures; pharyngeal cases, treated by the roentgen ray, 80 per cent of cures. It would seem possible to conclude from Dr. Hickey's work that a diminution in the bacterial content of the throat takes place following the use of the roentgen rays, but, on the other hand, if one endeavors outside of the body to influence bacteria growing in colonies on ordinary culture media by means of the roentgen rays, then we are told results are negative. A study of the evidence at hand with reference to the destruction of microorganisms tends to lead one to conclude that while in the throat destruction of microorganisms is shown by bacteriologic studies to take place, this destruction is probably not the result primarily of the action of the roentgen ray.

#### SUITABLE PREPARATION OF THE SOIL.

There remains for consideration this fundamental, and it seems as if this is the fundamental with which we are dealing when we influence certain conditions of the ear, nose and throat by means of the roentgen rays. Some time ago, while

treating a small growth on the face of a girl with very rosy cheeks, it was discovered after the treatment, that there was a blanched area on the face corresponding to the area treated, and approaching in size the small opening in the treatment cone. When asked how long this area remained whiter than the surrounding surface, the patient replied that the condition existed from two to three days. Following this observation, the mucous membrane of the throat was studied before and after treatment, and it was noticed that it developed a grayish appearance following roentgen ray therapy. It was also recalled to mind that one of the results to be expected from the treatment of uterine fibroma was cessation of the menstrual flow. If one looks up the histologic effect of roentgen rays, textbooks on roentgenotherapy tell us that by means of the roentgen rays we produce an edema of the endothelial lining of the blood vessels. This edema produces in the smaller capillaries a narrowing of their lumen, thus interfering with the blood supply of the part treated. If the roentgen rays are continued, an obliterating endarteritis is produced. With reference to our three fundamentals, in the light of all the evidence accumulated, it would seem feasible to conclude that primarily we change a suitably prepared soil into an unsuitably prepared soil by diminishing the blood supply of the part treated. In proportion as we are able to change suitable preparation of the soil, in like proportion are we able to destroy existing microorganisms, which require a certain type of soil for their growth. In proportion as we diminish the blood supply of lymphoid tissue of the upper respiratory tract, in like proportion are we able to influence the size of the lymphoid tissue.

#### POSITION OF ROENTGEN RAY THERAPY.

What position, then, is roentgen ray therapy to occupy in the nonsurgical treatment of ear, nose and throat diseases? Is it to occupy a position of primary importance? It hardly seems possible that it can ever occupy this position, because this position will probably always be occupied by local measures which time has proven to be of value. Is it to occupy a position of secondary importance? It hardly seems possible that it can ever occupy this position, for this position will

probably always be occupied by results one is able to obtain from regulating the patient's diet. But when all other measures have failed, and there comes to one a desire to produce an adrenalin effect in the parts under consideration, this adrenalin effect extending over two to three days when one treatment is given and longer if four treatments are given at three day intervals, then roentgen ray therapy comes into its own, and there comes to one a feeling of greater efficiency when it is possible to influence conditions of the ear, nose and throat which have resisted ordinary treatment. Time has a way all its own of taking care of any therapeutic agent, and time will probably eventually show the position to be occupied by roentgen ray therapy in the nonsurgical treatment of ear, nose and throat diseases.

## LVII.

### A UNIVERSAL COUPLING FOR IRRIGATING CANULAE IN OTOLARYNGOLOGY.\*

BY LEE M. HURD, M. D.,

NEW YORK.

The small piece of apparatus to be described is offered as an addition to the already very extensive armamentarium of the otolaryngologist, with the idea that it may prove of service in the practice of those who wish to speed up and simplify one phase of office treatment.

The apparatus consists of a universal coupling made, as is shown in the accompanying cuts (Fig. A), in two portions, a male and a female part. The female portion consists of a thin cone of metal which is, of course, hollow throughout. The cone is truncated at its smaller end; this end of the cone is to be soldered or brazed into the handle end of the irrigating cannula to be used, as is shown in the cuts (Figs. C and D). Near the larger end of the female part of the coupling is a slot which runs for a short distance in the long axis of the cone, and then for a somewhat greater distance approximately at right angles to the long axis of the cone. This is the slot for the bayonet catch of the coupling.

The male portion is made of heavier material, usually brass, and is turned so that one end is a cone, which fits snugly into the larger end of the female part. This cone is about a centimeter long and has, somewhat less than half a centimeter from its free end, a small stud of a diameter just sufficient to fit into the slot cut in the female part. The other end of the male part is turned with a bead so that a rubber tube will slip over it and fasten snugly. The whole portion is bored with as large a drill as the thickness of the metal will permit.

\*Presented at the meeting of the Eastern Section of the American Laryngological, Rhinological and Otological Society, Boston, January 24, 1925.

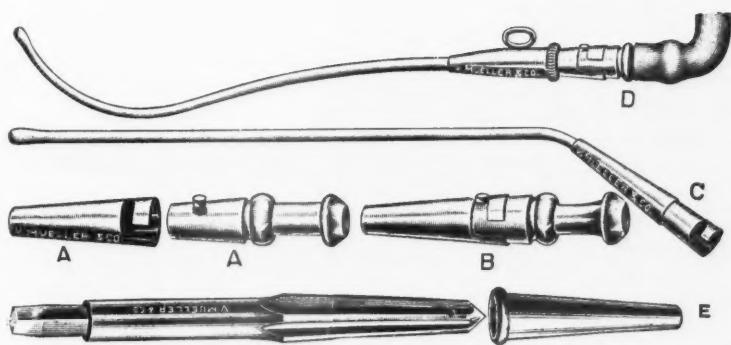
In use, the male portion of the coupling, with its rubber tube, slips easily into the female part on the cannula, and is firmly held by a slight twist within the cone of the female part, the stud of the male part fitting in the slot of the female, on the familiar principle of the bayonet catch. This is shown in the cut (Figs. B and D).

Female portions should be fixed in the handle ends of all the cannulae used in irrigating, such as those for attic douche or Barany tests in the ear, for irrigation of each of the various sinuses, either by the natural orifices or by puncture. If the surgeon is mechanically inclined, he can himself fit the part into his cannulae, first enlarging the opening in the handle end of the cannula by means of a special reamer, and then soldering the cone into the opening thus made. This male end of the coupling is slipped into a piece of rubber tube, which will convey irrigating fluid from either a syringe or a pressure bottle built on the principle of the ordinary atomizer.

If all of one's cannulae are so equipped, it is a very easy and quick matter to use any or several of them in quick rotation, as the connection is made at once, is leakproof, and will not come apart under any ordinary pressure of fluid; it is at once released when the irrigation is over. Using the pressure bottle, the chances of putting the irrigating fluid anywhere but the place it was intended for are reduced to a minimum.

Further than this, it is an easy matter to have the end of the male portion of the coupling that goes into the rubber tube when used with a wash bottle reamed out to fit closely over the tip of a Luer or other syringe, so that a small amount of a solution may be injected through any of the cannulae fitted with the coupling.

Cut E is of the reamer that is used to fit various instruments to receive the female member for soldering.



Universal Coupling for Irrigating Cannulae.

## LVIII.

### FOOT VALVE FOR SUCTION APPARATUS—A DEVICE TO INCREASE ITS EFFICIENCY.\*

BY LEE M. HURD, M. D.,

NEW YORK.

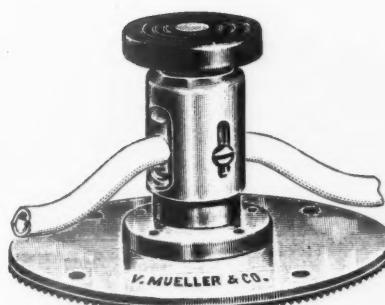
This foot valve is to hold the vacuum until required. The ordinary suction apparatus of the water filter pump type has a very low vacuum, unless the tube from the pump is closed; then the vacuum will rise in proportion to the water pressure. With 65 pounds water pressure, the vacuum will reach 27 inches, and by confining this vacuum with the foot valve there is a reserve that is strong and efficient. Also, whenever less vacuum is required, it is easily reduced by keeping the valve open until the vacuum registers the amount wanted. The suction continues just as long as the foot holds open the valve.

The rubber tubing from the pump and bottle is passed through the foot apparatus, and the tubing is compressed by the apparatus and acts as a valve. Pressure with the foot releases the compressed rubber tubing, permitting the air to rush through to overcome the vacuum.

The drawing shows the pump connected to water faucet, and from pump thick walled rubber tubing extends to a vacuum gauge, then to a large bottle at least five pints in size, the larger the better reserve; then the tubing passes through the foot shutoff, which constantly compresses the tubing and is only released by pressure with the foot. From here the tubing extends as long as is necessary to be connected with whatever instrument is required.

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\*Presented at the meeting of the Eastern Section of the American Laryngological, Rhinological and Otological Society, Boston, January 24, 1925.



Foot Valve for Suction Apparatus.

LIX.

A BRONCHOSCOPIC DOUBLE POINT GRASPING  
STAPLE FORCEPS.\*

BY GABRIEL TUCKER, M. D.,

PHILADELPHIA.

In the bronchoscopic removal of a staple, points up, the mechanical problem to be solved is the removal of the staple without trauma from the points. This may be done in two ways; by covering the points in such a way as to avoid trauma, or by the rotation of the staple so that the points are downward. During the removal in this position the points trail and do not traumatize. The forceps are devised with the thought in mind of covering both points of the staple. They are so constructed that, when the forceps are closed, the points remain slightly separated, the separated points acting as a guide to the little pocket or sheath that is attached to one of the blades of the forceps.

The maneuver to be executed in the use of the forceps is to engage one point of the staple between the separated lips of the closed forceps, and by advancing the forceps, pass the point into the little protecting pocket attached to the forceps' lip. The forceps are constructed with a stiff expanding spring so that after the engagement of one point of the staple in the protecting pocket of the forceps lip, the forceps blades are opened in the plane of the staple. The free blade of the forceps being allowed to pass behind the free limb of the staple, the forceps is turned slightly so that the lip of this blade will pass back of the free limb of the staple. The pocket on the other blade, exerting a pull on the engaged limb of the staple, will have a tendency to pull the staple toward the blade of the forceps in which it is engaged. The forceps are then turned slightly so that the lip of the side curve on the free

\*Presented at the meeting of the Eastern Section of the American Laryngological, Rhinological and Otological Society, Boston, January 24, 1925.

blade will pass outside the unengaged limb of the staple. The forceps are then closed and both limbs of the staple are being grasped with the forceps. If the point of the staple is imbedded, the forceps and the staple are carried slightly deeper in the bronchus in order to disengage the imbedded point. It is then withdrawn from the bronchus until the lumen of the bronchus will allow the lip of the bronchoscope to be turned so as to cover the point of the staple that is exposed. It is held in this position and the staple forceps and the bronchoscope are withdrawn together. In this way both points of the staple are grasped and covered so as to avoid trauma to the bronchus.



Fig. A.

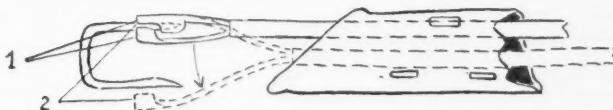


Fig. B.

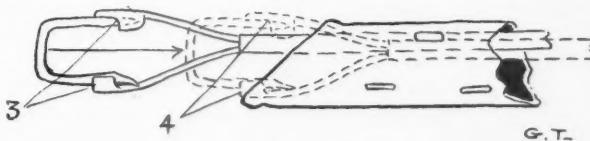


Fig. C.

Fig. A. Shows closed forceps ready for application to the free point of the staple.

Fig. B-1. Shows forceps advanced over the free limb of the staple.

Fig. B-2. Shows the point of the staple engaged in the pocket of the forceps blade, and the free blade of the forceps expanded beyond the unengaged limb of the staple.

Fig. C-3. Shows the forceps closed on both limbs of the staple.

Fig. C-4. Shows the method of protecting the exposed point with the lip of the bronchoscope for withdrawal through the glottis.

LX.

RETROGRADE LARYNGOSCOPE.\*

BY GABRIEL TUCKER, M. D.,

PHILADELPHIA.

In certain patients, in whom there exists a fistula in the larynx or trachea, as in tracheotomized or laryngostomized patients, it is often desirable to examine the larynx from below. It is also often desired to remove papillomata or a specimen of tissue for biopsy, or in cases of stenosis, to dilate the larynx retrograde. The desirability of carrying out these procedures led to the devising of this retrograde laryngoscope. In the introduction of any of the standard forms of endoscopic tubes retrograde through the tracheotomic fistula where the patient has laryngeal obstruction, the great difficulty has been the obstruction to the patient's breathing. In this particular instrument this has been overcome by multiple perforations in the tube of the laryngoscope, allowing the patient to breathe freely through the holes while the instrument is in use.

Two types of instruments have been devised. The first, a self illuminated instrument, is equipped with the standard Jackson bronchoscopic lamp and light carrier in a separate canal. Of this type, two sizes have been constructed, a 4 mm. standard type, and a 5 mm. full lumen, the same as are used in the Jackson bronchoscopes. The second type is not self illuminated, and illumination may be carried out by a headlight or by using the Jackson light carrier to illuminate the tube independently. The sizes are 4, 5, 6 and 7 mm. in diameter, full lumen tubes. This type of tube is particularly desirable for retrograde bouginage. Each instrument is a modification and adaptation of the Jackson bronchoscope, and each is for use in the retrograde examination of the larynx.

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\*Presented at the meeting of the Eastern Section of the American Laryngological, Rhinological and Otological Society, Boston, January 24, 1925.

RETROGRADE LARYNGOSCOPE.

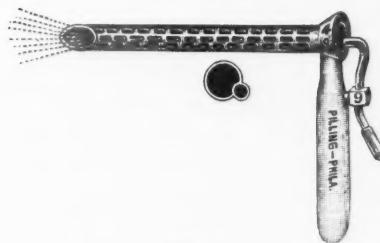


Fig. A.  
Self-illuminated retrograde laryngoscope.



Fig. B.  
Retrograde laryngoscope to be used with  
headlight or light carrier.

LXI.

SOUND PRODUCTION.\*

BY CHARLES ADAMS WHITE,

BOSTON.

Sound is air in motion, variably obstructed, or air stationary, put into variable motion by an elastic substance.

In a string instrument, the solid is the active principle, acting on a stagnant fluid. In a wind instrument the fluid is the active principle, acting on a stagnant solid.

The mechanics of musical instruments consist of three elements: A motor, a vibrator, and a resonator.

For the violin, the bow is the motor, the string is the vibrator, and the body of the instrument is the resonator.

For a reed instrument, the breath of the player is the motor, the reed is the vibrator, and the body of the instrument is the resonator. And likewise with other musical instruments.

The vocal apparatus, also, as a tone producing instrument, is made up of these three elements. The breath is the motor, the vocal cords the vibrator, and the cavities of the mouth, pharynx and nose the resonator.

This vocal apparatus is a superior tone producing instrument, because it can change the relation of the overtones to the fundamental by means of vowels, and can shape the resonator for tone color. Vowels alter the shape of the mouth cavity, changing its pitches as a resonator, while the pitch of the fundamental tone at the larynx is held unchanged or moved at will.

Vowels, with the articulation of consonants, constitute the material for speech or song.

To illustrate the changes of pitch in the mouth cavity, we whisper the vowels, oo, oh, ah, eh, ee. We hear the color pitch rise from oo, through the series. This is called the funda-

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\*Read at the meeting of the Eastern Section, American Laryngological, Rhinological and Otological Society, Jordan Hall, Boston, January 24, 1925.

mental vowel scale. There are intermediate shades of vowel sounds between these. In English, we use several of them. The more gradual rise of the vowel scale in English is shown in these words: fool, full, foe, for, fun, far, fan, fen, fane, fin, feel.

When we whistle a tune, the sound is produced by the pressure of the breath through a small aperture, formed by the contraction of the lips. The various resonance pitches are made by the adjustment of the mouth cavity to whatever position the required pitch demands.

In the toy instrument, called the Jew's harp, we have another illustration of the vowel pitches of the mouth.

This little instrument consists of a small metal frame, to which is attached a thin metal tongue, that can be plucked into vibration. It has but one sound, the pitch of the metal tongue. When it is placed between the front teeth, allowing its vibrations to communicate with the mouth cavity, the sound is increased. By adjusting the vowel positions of the mouth, one can play upon the overtones of the vibrating tongue and approximate a tune.

Helmholtz demonstrated this principle by the use of resonators of appropriate sizes, which responded to the fundamental tone of a tuning fork. In this way he obtained various vowel sounds by synthetic resonance. This was but an imitation of what takes place in the mouth, automatically, when we emit the vowel sounds.

Unlike any other tone producing instrument, the larynx is a vibrator and also a resonator. It opens for the intake of breath and closes, in various degrees of resistance, to check the escape of breath. The vocal cords, acting as a vibrator, reinforced by the inflation of the ventricular cavities acting as a resonator, make the larynx a unique source of sonority.

This small resonator in the larynx, in connection with the larger one above, of pharynx, mouth and nose, gives us a double resonator. The larger resonator magnifies the sound of the smaller one without increase of force.

I am aware that some authorities on vocal physiology have claimed that the ventricular bands and ventricles have no office whatever in the production of voice.

The socalled false cord theory in voice production was advanced by Charles Lunn of England, a singer and teacher, author of "Philosophy of Voice." This theory met with opposition. But there are many vocal physiologists who now accept it. The laryngologists who were opposed to it based their objections on a laryngoscopic examination of the vocal cords during the production of voice. It is impossible to produce a normal tone while the laryngoscope is being used.

Hermon von Meyer, in his work, "The Organs of Speech," and Dr. Pierre Bonnier of Paris, in his work, "La Voix: Sa culture physiologique," are among those who support the false cord theory.

For the vocal artist, the interpreter, a knowledge of scientific tone production is not only unnecessary but is sometimes an obstacle to free expression. For the vocal teacher some knowledge of the science underlying voice production is not only helpful but almost indispensable.

The old masters of singing taught only those few gifted pupils who gave promise of success as public singers. The art of instrumental and vocal music is now studied more generally. Teachers of today have to overcome many unfavorable conditions that were never presented to the old masters.

In making tone, by mechanical means, the scientist can construct and reconstruct his apparatus for experimentation. The vocalist has to take his instrument as it is. The majority of our students, before beginning their vocal studies, have sung more or less, without any knowledge of the art. They have unconsciously formed bad vocal habits. Also, many of them have incorrect habits of speech.

The consonant "r," following a vowel, often presents a difficulty which requires special drill, in order to overcome its corrupting influence on the vowel to which it is joined. Examples, America, murmur, etc. The vowel "u," as generally pronounced by a Southerner, has quite a different sound from that of the Northerner.

The diphthong "ou" or "ow," in such words as "down," "round," etc., as sometimes pronounced, gives it a flattened form. In singing, these habits of speech distort the tone and must be corrected. Educators might devote more attention to the training of the voice in speech. The phonograph and

the radio could be used in the schools, to give the children daily examples of refined speech.

In singing and in speech we first conceive, then we must hear distinctly what we wish to express, before producing it. The more distinctly we hear before producing, the more perfect is the result. We can only produce what we have already heard. Great interpreters and mimics have this power. Examples: This faculty can be developed. Singing students should work constantly in this way. Our first step in training the voice is to work for free emission of tones on vowels, later adding the articulation of consonants. This method should be followed also in teaching the deaf to speak.

Some years ago, I was asked to instruct Miss Helen Keller, to enable her to speak intelligibly in public. The problem of getting sufficient resonance and articulation of consonants from a pupil who could neither see nor hear interested me. After three years Miss Keller was able to lecture in public. She spoke with a full, though a monotonous tone, and articulated quite distinctly. In private conversation, she was easily understood.

If I could have given her the same attention when she was thirteen, instead of thirty, it would have been easier for both of us.

While I was able to keep in touch with Miss Keller she continued to improve.

For some years Miss Keller has not lived near Boston. Hearing her speak in public last year, I was disappointed but not surprised to find that she spoke much less distinctly and had very little resonance.

As a result of my work with Miss Keller, I was asked to give a series of talks to teachers of the deaf, in a school in New York City. On my first visits I examined about 40 pupils. As with Miss Keller, so with all of the pupils examined, not one of them could control the breath at the glottis. All the breath escaped or there was too great tension. They could block the breath with the lips (p), with the tip of the tongue against the roof of the mouth (t), and with the back of the tongue against the soft palate (k), but they had not learned to do this at the glottis. Examples. Most of the pupils had very breathy voices and exaggerated efforts of

lips, jaw and tongue in articulation, while neglecting the source of real tone at the glottis.

From one of the teachers in this school I received an invitation to read a paper at the convention of teachers of the deaf in New York City last summer. I regret that illness prevented my doing so. I am interested in the work. I do not wish to criticise the work done for the deaf. I should like to pay public tribute to the teachers who have so faithfully and successfully worked to help those deprived of hearing. But I think that in training their voices, quicker and better results could be achieved by working for resonance before attempting articulation. This procedure was tried in the school referred to, with better results than formerly. Let me repeat that we first work for a free tone on vowels, later adding the articulation of consonants. As soon as interferences are removed and a good tone established, free delivery of voice and word is possible. We then work for beauty of tone. The imagination plays the important part of coloring tone and word for the interpretation of music and text.

Singing should be an expression of human emotions. Emotional quality is dependent upon the imagination. When imagination stirs emotion, the breath and the whole body are vitalized for the expression of that emotion. We seem to inhale the emotion that the imagination arouses. The facial expression and the quality of the tone released is the result of the quickened imagination and the emotional breath.

The imagination is the life of the voice in speech or song. The great art of singing has been developed on these lines.

Shakespeare has said: "Nature is made by no mean, but Nature makes that mean, and over that Art which adds to Nature is an Art that Nature makes."

LXII.

ELECTRICAL TRANSMISSION OF SOUND.\*

BY F. S. DELLENBAUGH, JR.,

BOSTON.

The art of communication has done a great deal to further all social progress which has developed into our present civilization. Looking back far into the past, we find the original tribes gathered together into clans through their ability to converse with one another and to form verbal contracts which could be understood by all those involved. This represents a very elementary form of communication, using air as the medium of transmission. A further extension of this has been developed by tribes of aborigines through signals produced by drums or hollow logs—a crude form of telegraph, still using air as the transmitting medium, which can be heard over greater distances than the voice alone.

Other more or less savage tribes have developed optical methods of signaling which, in some cases, were quite elaborate. The American Indians, with a smoky fire and a blanket, could produce dots and dashes similar to the Morse code by smoke columns in the air. These signals were used in times of peace for information in regard to hunting and tribal councils, while in times of war they served as valuable methods for gathering sections of the armies and reporting the observations of scouts. The use of optical methods of communication extended the range through which it can be used, and probably was developed to its highest point by Napoleon in connection with his series of semaphore telegraphs, by which messages could be sent for very long distances through successive relay stations.

Unfortunately, any methods dealing with sound or sight are subject to serious interruption, due to the vagaries of

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\*Presented at the meeting of the Eastern Section of the American Laryngological, Rhinological and Otological Society, Boston, January 24, 1925.

atmospheric conditions. Therefore, it was not until electric communication was developed that steady communication could be carried on without interruption by Nature, except in serious cases, such as exceptional ice storms or earthquakes.

With the gradual improvement of communications through the ages, the original tribal families have gathered into clans, and the clans enlarged into feudal domains; and from these into duchies or states, which ultimately led to the federation of states, resulting in the present arrangement of terrestrial geography. At the present time, we consider that each nation is a unit and that nations separated by boundaries to communications which previously have proved insuperable can still be considered isolated. Thus, the United States is generally looked upon by the public as being widely separated from Europe. With electrical methods, the United States is in communication with all other countries in the world, and the time required for a word symbol to reach Central Europe from America is about the same as the length of time it takes the speaker's voice to reach the back of this theater from the stage. At present the commercial lines are using some form of Morse code, and with automatic precision can send intelligence at about the same rate that it is ordinarily spoken.

With the development of the telephone, the United States is now covered with a network by which it is possible to talk from any city to any other city.

Everyone is familiar with the use of radio for broadcasting, and the question of extending the radio so that continents will be linked with the telephone is one of economics rather than engineering. We, therefore, see the extreme rapidity of electrical communication annihilating space and joining the world together in a fraction of a second.

Some of the points in connection with electrical communication are of a good deal of interest. The energy necessary to carry on a reasonable conversation represents about one-billionth of the power needed to operate the usual type of electric light. In order to transmit energy over any distance, however, losses must be overcome and the lines must be free from distortion. This latter subject is the one upon which Dr. Fletcher has been talking this evening, and, as you have

noticed, it is important that the frequencies within a certain range should be transmitted properly in this respect. The first step in long distance telephony came when circuits, quite free from distortion, were developed by the use of loading coils, which were simply units of inductance put in telephone lines at approximately every eight miles in order to balance the distortion effects which would result from the wires alone. This allowed telephone communication to be extended considerably, but the distance was still limited by the losses in the circuit.

Quite recently, the invention and development of the vacuum tube amplifier has overcome this difficulty, and it is now possible to transmit from one end of the United States to the other with the loudness of the received signals just about the same as is received on short lines. This involves a series of repeater stations, each of which amplifies the sound. Each of these repeater stations in turn must also be free from distortion. The amount of amplification necessary for the trans-continental lines can perhaps be understood from the fact that if the amplifier stations were not present and it were possible to put all the energy developed by the sun into speech at one end the signals reaching the other end of the line would be inaudible.

In closing, I would like to say a word in regard to quality of reception. Dr. Fletcher has shown the effects resulting from robbing sounds of certain frequencies. With all electrical apparatus, some frequencies are transmitted better than others and, therefore, distortion results. With high quality amplifiers, such as have been used in the demonstration this evening, this distortion is reduced to such a small amount that it can be detected only with difficulty and really requires elaborate laboratory measurements to show the deviation. With the ordinary telephone system, sufficient frequencies are transmitted to make speech easily intelligible. With the interlinkage of broadcasting stations and land lines, in order to transmit music properly the breadth of the frequency band transmitted must be much better than that used for ordinary speech. It is, then, necessary to make sure that the radio waves broadcast reproduce everything they receive from the

land lines and that the receiving set can reproduce everything it receives from the radio waves. When it is considered that, starting with the voice of the performer, we go through at least four conversions of the vibrations from one form to another and that each conversion involves anywhere from one or two to a large number of pieces of apparatus, each one of which may introduce distortions, it is really remarkable that the ultimate reproduction is so faithful to the original sound.

## LXIII.

### THE RELATION OF THE NOSE AND THROAT TO ENDOCRINE DISTURBANCES.\*

EDWARD A. LOOPER, M. D.,

BALTIMORE.

During the past few years considerable attention has been directed to disturbances in function of the endocrine glands.

It is generally admitted that infection is one of the most important etiologic factors in producing changes in these organs. As the sinuses, tonsils and teeth are the most common sources of focal infections, the subject should be of particular interest to one in our specialty.

The endocrine system is composed of a number of socalled ductless glands which produce complicated chemical substances termed "hormones."

These internal secretions contain very active chemical agents which are disseminated throughout the body by the circulating fluids and are capable of producing striking reactions in remote organs. Some of these substances play an important part in early growth and development, while others are just as significant in relation to destructive changes and disease processes.

The endocrine organs which have been studied most and those in which the incretory phenomena is best understood may be briefly summarized as follows:

The hypophysis cerebri, or pituitary gland. The epiphysis cerebri, or pineal gland. The lymph glands including the tonsils and adenoids in which we are particularly interested. The thyroid and parathyroid glands. The suprarenals, which consist of two parts having entirely different functions (a) the medullary or chromaffine portion, (b) the cortical or internal portion. Also the pancreas containing the islands of Langerhans, in which insulin is generated.

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\*Read before the American Laryngological, Rhinological and Otological Society, Annual Meeting, May 29, 1924, St. Louis, Mo.

Another group, the socalled "puberty glands," the ovaries and testicles, the active part being the interstitial tissue of the gonads.

It is also probable that the salivary glands, spleen, liver, kidneys and prostate may form some endocrine substances in addition to their normal physiologic secretions.

While these glands may secrete special substances with specific actions, it must be remembered that there is a close relationship between the whole endocrine system, for as Barker<sup>1</sup> states, "The conception that the endocrine organs are linked together so as to form a system of reciprocally dependent organs (hormonopoietic system) has gradually gained credence not only among clinicians, but among physiologists and pathologists." So that any condition which alters the function of one gland may indirectly disturb the equilibrium of the whole hormonopoietic system.

#### THE PITUITARY.

Some interesting investigations have been made by Citelli, Caliceti, Basile, Bryant and others on the relation of adenoid vegetations and infections in the pharynx and rhinopharynx to altered functions of the cerebral and pharyngeal pituitary.

According to Citelli<sup>2</sup>, the vascular supply of the nasopharyngeal mucosa and the hypophyseal region is closely related by an anastomosis of the small veins and capillaries supplying the mucosa and submucosal tissue.

So that infected material or toxins which are generated in the nasopharynx or on the pharyngeal mucosa would have ready access to the pituitary glands, and as stated by Bryant<sup>3</sup>, "Common inflammations of the pharyngeal mucosa exert an injurious effect upon the functional and the anatomic development of the pharyngeal hypophysis and indirectly upon the cerebral hypophysis. In chronic hypertrophy of the pharyngeal tonsil the pharyngeal hypophysis is likewise hypertrophied, as would be most natural considering its relations with the pharyngeal tonsil as component parts of the defense mechanism."

Caliceti<sup>4</sup> has reported several cases of abnormal pituitary function manifested by feminism, sexual frigidity, female

delicacy of skin and hair, with the psychic syndrome of poor memory, somnolence, listlessness and difficulty of fixing attention. These cases were adenoid subjects and striking changes developed following adenoidectomy.

As an example, one of the cases cited was examined eight months after the adenoids had been removed and it was found that remarkable mental and physical changes had taken place. His color had improved, he was more robust, slept regularly, was vivacious and intelligent. Memory was good, and he could endure marches without fatigue. He claimed that he was now obliged to shave every five or six days and that the hair in the pubic region had altered and that his sexual frigidity had disappeared.

In Bryant's cases,<sup>3</sup> where there seemed to be a chronic hypopituitarism, marked improvement of symptoms followed post-nasal medication and adenoidectomy.

There was a decided improvement in general health, growth was more rapid, nutrition much better, mental symptoms relieved, blood pressure was regulated and circulation improved.

The pituitary system plays a vital part in the normal influence of body growth and development as has been shown by Cushing<sup>5</sup>. Disturbance in its regular function then should show retardation of growth, disturbed nutrition, improper circulation, lowered resistance and lack of mental and physical development.

This is about the type of picture we get in certain cases of children with infected adenoids and tonsils.

The typical adenoid facies gives us the thick lips, pointed chin, high arched palate, dull expression, pallor, underdevelopment and mental apathy. It hardly seems plausible that such a group of symptoms would result from purely mechanical factors of nasal ventilation, or from limited local infection unless there was some indirect involvement of the endocrine system.

#### THE THYROID.

The relation of diseases of the thyroid to infections around the nose and throat has been the subject of investigation for a long time.

As early as 1899 Marcel Garnier<sup>6</sup> demonstrated pathologic changes which could occur in the thyroid gland as a result of infection. Since that time many observations have been made and much has been written concerning the role of infection in thyroid disturbances.

On account of the related embryologic development and anatomic proximity of these structures, it is but natural that diseases of the sinuses, teeth, tonsils and infected mucosa should have an influence on thyroid pathology.

Even though a direct connection between the lymphatic and vascular channels of the throat and thyroid gland has not been demonstrated, there is sufficient clinical evidence to show that such a relationship must exist.

Beilby,<sup>7</sup> Carter,<sup>8</sup> Lahey,<sup>9</sup> Edwards,<sup>10</sup> Voorhees<sup>11</sup> and others have reported cases of acute thyroiditis following acute attacks of tonsillitis and infections around the nose and throat.

In a study of one hundred cases of thyroid deficiency, Harvey Beck<sup>12</sup> states "That chronic infections are almost invariably associated with glandular syndromes. These infections are usually focal in character and seem to occur in relative frequency in insufficiency of the thyroid, pituitary, gonads and adrenals.

Thirty-six per cent of his cases showed infections of the teeth, tonsils and sinuses.

The infectious origin of goiter has been given greater weight by the bacteriologic research of Gilbride,<sup>13</sup> Rosenow<sup>14</sup> and others who have repeatedly isolated organisms from the thyroid in goiter.

Bloodgood<sup>15</sup> found an infected nasal cavity or infected tonsils in fifty per cent of his toxic goiter cases.

Ninety per cent of Barnhill's<sup>16</sup> goiter cases had diseased tonsils and he feels that infection is the most plausible theory in the case of goiter.

Joseph Beck<sup>17</sup> has reported a number of thyrotoxic cases which have been benefited by tonsillectomy and he is of the opinion that the tonsils should be removed first, even before ligation is attempted.

Layman<sup>18</sup> states that thirteen cases of hyperthyroidism were improved after diseased tonsils were removed.

Billings<sup>19</sup> called attention to the frequency of thyroid intoxication in young girls who had focal infections in tonsils, sinuses and teeth.

Reed<sup>20</sup> reported fifty cases of thyroid hypertrophy under twelve years of age coincident with chronic gingivitis. Along the same line Osborne emphasizes the importance of mouth infection in thyroid diseases, as he feels that fifty per cent of the cases of hypersecretion and hyposecretion of the thyroid result from infection around the teeth and gums, and after eradicating the infected area no other form of treatment will be required.

Layman<sup>18</sup> obtained some valuable data on this subject by sending out a questionnaire to various surgeons interested in thyroid surgery. He found that there was a general uniformity of opinion that the tonsils should be removed in thyroid cases. Some differed as to the time to remove them. Crile, Halsted and the Mayo Clinic operate on the thyroid first and remove the tonsils afterwards, while Bloodgood, Beck<sup>21</sup> and Beebe<sup>22</sup> take the tonsils out first.

Commenting on the treatment of goiter, Elliott<sup>23</sup> lays particular stress on the removal of focal infections. He states: "Our experience in this regard has left us with the conviction that infection of any kind—general, local or focal—has a profound influence on the activity of the thyroid gland. The frequency with which thyroid overactivity has occurred during the convalescence or has followed in the train of general infections, such as influenza, bronchopneumonia, acute tonsillitis, etc., and the frequency with which thyroid overactivity has seemed to be reduced by the removal of evident foci of infection, especially those about the head (regional), have convinced us that an important relationship is not entirely clear; it may be a direct result of the action of the organisms on the thyroid itself, or it may be concerned with a more indirect effect on the chemistry of the body, such as an influence of the iodine store of the blood.

Manifest foci of infections should be removed for the specific purpose of influencing thyroid activity as well as from the standpoint of general health insurance despite prejudice aroused by the wholesale removal of doubtful foci."

In order to formulate a definite therapeutic policy for the treatment of exophthalmic goiter, a group of investigators<sup>24</sup> at Mount Sinai Hospital, New York, studied fifty unselected cases of hyperthyroidism. No specific therapy was given and the symptoms and basal metabolism changes were carefully followed. No special medication was instituted, but particular attention was directed to focal infections in the nose and throat. After two years of observation it is interesting to note that their final results compared favorably with those usually following thyroidectomy.

This would lead us to believe that it might be better to pay more attention to eliminating nose and throat infections and to simple medication instead of so quickly resorting to the more radical procedures of thyroidectomy.

Certainly in every case of thyroid disturbance a most careful nose and throat examination should be made and all foci of infection should be eliminated as far as possible.

#### THE SPLEEN.

In a section entitled "Relation of the Spleen to Bacteria and Protozoon" William Mayo<sup>25</sup> writes:

"Not infrequently living organisms are introduced into the human economy and such introduction irritates body resistance. Vaughan has pointed out that a patient has typhoid during the prodromal period, but that which we call typhoid is Nature's defense manifestations. Preventive serums such as vaccination for smallpox, typhoid, etc., act to educate the cells of the body to resistance.

It is probably true that at times such organs as the tonsils, which permit bacteria to enter the blood stream, are acting as immunizing agents, allowing the early introduction of a few bacteria which act to cure rather than cause the disease.

Enlargements of the spleen from chronic sepsis are not uncommon and may act as secondary distributing centers of infection. Focal infection in various parts of the body may act as the primary source of the bacterial invasion."

Maynard<sup>26</sup> and Munro<sup>27</sup> have reported cases of acute myelogenous leucemia following apiceal abscesses. Blair<sup>28</sup> had a case of Hodgkins disease beginning in the cervical lymphatics

apparently engrafted upon an acute septic adenitis of dental origin.

Percy<sup>29</sup>, Griffin and Szlapka<sup>30</sup> emphasize the importance of cleaning up focal infections around the nose, throat and teeth in pernicious anemia cases.

#### THE OVARIES.

In a "Contribution to the Etiologic study of Ovaritis" Davis<sup>31</sup> reports a number of cases which seem to prove a hematogenous infection of the ovaries. The infection appeared to come from diseased tonsils. He had several cases of disturbed menstruation associated with severe colds.

Wiener<sup>32</sup> has also reported a case of hematogenous infection of the ovary, while Danforth<sup>33</sup> attributes the production of chronic hemogenic salpingitis to focal infection in the teeth and tonsils as recorded in his article.

It is well known that the nose is closely related to ovarian disturbances. Pathologic conditions of the nasal tissue can produce reflex action in distant territory. Nasal polypi, turgescent mucosa and septal deviations should be looked for in unexplained cases of dysmenorrhea.

Dionisio<sup>34</sup> calls attention to a case of disturbed menstruation which was corrected after treatment of ozena by radiation.

The socalled "genital spots" in the nose appear to be intimately associated with the pain in certain menstrual disorders.

Mayer<sup>35</sup> claims to have obtained permanent relief in fifty to seventy-five per cent of his cases of dysmenorrhea by cauterizing these sensitive nasal areas. As the erectile tissue in the turbinates becomes greatly engorged during the menstrual phenomena, it is common experience for certain patients to complain of headache only at this monthly period. This can be easily explained on a mechanical basis of pressure and nerve irritation. Permanent relief is obtained in these cases by correction of a deviated septum, or by a turbinectomy.

This reflex nervous manifestation indirectly has a bearing on endocrine disturbances for the whole nervous mechanism is easily upset at this time, and as the hormonopoietic system is so closely related, disturbance in function of one gland may seriously alter the activity in others, although they be in a remote region.

## THE PANCREAS.

While there has not been as much written regarding the influence of focal infection on pancreatic pathology as we find with some of the other endocrine glands, there is sufficient evidence to show that the toxins from infected tonsils, teeth and sinuses may irritate and injure the secreting structure of this organ.

Such an eminent authority as Allen<sup>37</sup> states that "It is known from universal experience that infection lowers the tolerance and creates an increased tendency to glycosuria, hyperglycemia and acidosis."

Joslin<sup>38</sup> is even more specific regarding the importance of infected tonsils in diabetic cases, for to quote from his latest book on this subject, he says: "With the greater freedom exercised in advising operations upon diabetics today, this handicap of age will decrease. It will be particularly reduced by the frequency with which tonsillectomies upon young children will be performed. The presence of damaged hearts, arteries and kidneys among these patients is to be blamed in serious prognosis equally with the diabetes."

My actual contribution to this subject is an effort to present five cases of glycosuria which appeared to result from infections around the nose and throat, all of which cleared up promptly after removal of the infected tissue.

An abstract of my cases follows:

Case 1. H. T., age 25, was referred by Dr. Gordon Wilson, who suggested the possibility of infected tonsils being the cause of glycosuria in this case.

Patient entered the hospital complaining of some digestive disturbances, palpitation of his heart and frequent attacks of tonsillitis.

Physical examination showed the patient to be well nourished, skin dry and somewhat pale, some anemia of conjunctiva and mucous membrane of the lips. Extraocular structures negative, muscular movements good in all directions, pupils round, equal, react to light and accommodation, fundi negative, vision 20/20. Ears were negative. Nose, some clouding of left antrum, confirmed by X-ray. Teeth, a number missing, a few carious roots. Tonsils, enlarged, deep crypts, and appear to be definitely infected. Cervical glands enlarged.

Chest, sticky rales at extreme right base. Heart negative, except for some roughening of first sound at apex. Abdomen and extremities negative. Urine showed a decided sugar reaction, present after repeated examinations and corrections of diet. Blood chemistry also showed presence of sugar at each analysis. Wasserman negative. Blood culture negative. Normal blood cell count. Throat smears showed usual flora. Cultures. Some gram positive diplococci. A few short chains of cocci. No diphtheria bacilli. Sputum, stools and gastric analysis negative.

Tonsils were removed under local anesthesia. After operation sugar gradually disappeared from urine. General condition improved rapidly and he was discharged from hospital able to eat regular diet without sugar appearing in urine at any time.

Case 2. This patient, the child of a physician, is especially significant as the father noticed sugar in the urine during each attack of tonsillitis. Since removal of tonsils urine has been sugar free.

William M. Jr. Age 3½ years.

Family History.—Negative to T. B., cancer, nephritis and diabetes.

Past history—Born normally, weight at birth 7 lbs., breast fed up to fourth month, afterwards artificial feeding. At age of six months had an attack of tonsillitis. Duration five days. When fourteen months old had another attack of tonsillitis. Rather severe. Throat culture showed abundant streptococci. Duration about a week. At age of two years a third attack, less severe than other two.

Throughout the first three years of life he was always undernourished and appetite was poor. Dentition began at ten months. Walked at one year of age.

Present Illness.—On December 2, 1923, while suffering from a continually mild attack of coryza and tonsillitis, examination of urine showed the presence of sugar. A twenty-four hour specimen taken the following day, Dec. 3, was also positive to sugar. There were no other symptoms present, except those incident to the above mentioned coryza. Polyuria, polydipsia and polyphagia were absent.

The child was referred to Dr. Lockard for a physical examination, which showed nothing except that he was under weight (31 lbs.) and the presence of enlarged and badly infected tonsils. He was placed on a rigid diet until urine was sugar free and then advised to have the tonsils removed.

Recovery from the operation was prompt and with the recovery there came a decided change in his general health. Within a month he gained nine pounds. Appetite splendid. Bowels regular. Immediately following operation sugar disappeared from his urine and he now eats a regular and unrestricted diet of approximately 80 grams of carbohydrates, 60 grams of protein and 120 grams of fats without the slightest trace of sugar developing in the urine.

Case 3. Mrs. B. W., age 38, was referred for the removal of infected tonsils.

Family history was negative.

Past History.—Ordinary childhood diseases. No other infections except a mild case of "flu" the previous winter which had caused slight impairment in hearing.

Operations—A suspension of the uterus seven years ago.

Present Illness.—Began two years ago with general rundown condition. Malaise, poor appetite, nervous and felt tired all the time. Has had frequent attacks of "sore throat" and feels as if pus were dripping down from right tonsil. No arthritis.

Physical Examination.—Patient is 38 years of age, thin, under weight and undernourished. Hair thin and prematurely gray. Eyes, ears, nose and teeth negative.

Tonsils embedded, deep crypts from which seropurulent material can be expressed. Clinically they appear to be infected.

General physical examination was negative except for the urine, which contained sugar.

Since removal of tonsils patient has had no return of sugar in the urine, has gained weight, feels fine and in every way greatly benefited.

Case 4. C. C., age 40, was admitted to hospital for drainage from an infected sublingual gland. His examination was practically negative except for the fact that there was considerable sugar in his urine.

This glycosuria appeared to definitely follow the infection, as he had just been examined for life insurance a short time before present trouble started and the urine was negative at that time.

After drainage of the abscess, urine promptly cleared up and has been entirely free of sugar since operation.

Case 5. R. K., age 50, gave an interesting history. He was a conductor on the B. & O. Railroad and had been discharged from service because he would frequently fall asleep during his run.

He continued to feel badly and finally consulted Dr. Harvey Beck, who found that his drowsiness was in reality a symptom of diabetes, which was due to badly infected sinuses. After drainage of the sinuses, ethmoids and antra, he immediately began to improve. The sugar disappeared from his urine. He has had no recurrence of his sleepy spells and is now working at his previous occupation as conductor.

These cases demonstrate the importance of cleaning up all infected areas around the nose and throat of patients with glycosuria. Constant absorption of toxins may ultimately so damage the pancreatic tissue that irreparable pathologic lesions may be produced. It is possible that many advanced cases of diabetes might be prevented if all foci of infection were eliminated with the first appearance of symptoms of glycosuria.

#### CONCLUSIONS.

There is sufficient evidence to show that infections around the nose and throat play an important part in causing disturbance of function in the endocrine system.

There should be very close cooperation between the surgeon, internist and laryngologist when treating these cases. Every case of altered glandular activity should certainly have the benefit of a careful nose and throat examination. For early attention to diseased sinuses, teeth and tonsils may be the means of preventing the development of serious pathologic changes in these organs.

Treatment will be more efficient and in some cases extensive operations may be avoided.

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## LXIV.

### PRELIMINARY REPORT OF STUDIES ON THE NASOPHARYNX.

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CINCINNATI.

There is no dearth of literature dealing with the embryology, histology and anatomy of the nose and throat, as well as on the physiology, pathology and surgery of these parts. With the exception, however, of considerations given to changes about the mouth of the eustachian tube and to the so-called adenoid in its relationship to health, body development and the act of respiration, very little is to be found in the literature of the last fifteen years dealing with variations in the morphology of the nasopharynx, or, as it has been styled, the post-nasal space.

It was only natural, with the dawn of our knowledge concerning the detrimental influences which pathologic changes in the tonsils and pharyngeal adenoid mass could exert on the growth and well being of the human organism, that our attention should be drawn to surgical consideration of these parts. We have come now to the point, thanks to educational campaigns, where even the laity recognize the so-called "adenoid face," and where the failure of proper nasal respiration is promptly laid to enlargement of the tonsils and "adenoids."

Both the general practitioner and the specialist in diseases of the nose and throat know that there are always certain individuals who do not have proper nasal respiration, even after the tonsils and pharyngeal adenoid have been removed. Then, strangely, from this group of cases not benefited by the removal of tonsils and "adenoids" can be separated individuals who do not present sufficient nasal pathologic changes to account for the persistent mouth breathing and for the voice changes incident to the loss of nasal resonance.

If, so far as we humanly can judge, the intranasal spaces are of sufficient amplitude and apparently clear, and the excess

of lymphoid tissue in the epipharynx has been cleared away, then what, may we ask, is the cause of the occasional persistence of the symptoms which we have come to believe are characteristic of nasal blockade? Just here let us remark that we wish to confine our meaning strictly to the persistence of difficult nasal breathing rather than to the persistence of mouth breathing, for that may be due to anatomic changes, making conscious effort necessary to keeping the mouth closed. As soon as sleep comes on or the attention is distracted in this type of case, then the mouth comes open, not only for the purpose of mouth breathing, but also because the upper lip is not ample to cover the teeth and come into proper apposition with the lower lip, except as conscious effort is made.

To keep the issue clear, we shall confine our discussion to the patient who, with his mouth closed, still has the feeling of nasal blockade in spite of the fact that his nose is clear and the epipharynx not blocked with adenoid tissue. It may be suggested that this is the type of case which can be benefited by spreading the palate bone. However, we have been informed by as eminent an authority as G. V. I. Brown of Milwaukee that he encounters occasional cases of this description which are not improved by this procedure. We must then consider the factors not ordinarily stressed in the examination and study of the nasopharynx.

Much has been written concerning the adenoid structure lying in the nasopharynx, and much energy has been expended in devising ingenious methods of removing this tissue. Also much consideration has been given to the changes occurring about the orifices of the eustachian tubes. Very little is to be found in the literature dealing with the morphology of the nasopharynx, and what little has been written in this regard has been largely concerned with variations in the position which the adenoid tissue may occupy and with the invention of some new style of curette for the removal of the same. Coolidge is one of the few who make mention of changes in the nasopharyngeal morphology as follows: "On the posterior wall a portion of the body of a vertebra may project into the cavity and is sometimes mistaken for an adenoid or other tumor."

There is practically no mention of variation in the shape of the nasopharyngeal space in the anatomic text and reference books in current use or in any others which have come into my hands. Ballenger's text book contains several plates, after Moure of Bordeaux, illustrating types of variation of the post-nasal conformity. Here again these plates are brought forward rather to stress the difficulty of removing a recessed adenoid than to inquire into the cause of that recession or as to whether there were deformities present in the neighboring bone structures.

So far as I can find, very little has been written concerning the cause of the variation of the position of the epipharyngeal adenoid structure, and no inquiry as to whether the bony structures forming the nasopharynx might of themselves have some influence on the act of nasal respiration. So certain have many men been in the past that the real difficulty lay in the nasopharynx that they have removed adenoid structure which obviously was recessed out of the air way of the epipharynx in the hope that in some magical way free respiration might be restored. The fact that these cases are not encountered in great numbers has been a contributing cause to our failure to carry our inquiries beyond the purely surgical phases of the difficulty.

At this point it is in order to present a brief description of the postnasal or epipharyngeal or nasopharyngeal space. Briefly, it is that area lying behind the nose and above the level of the soft palate. It has six defining walls; anterior, posterior, two lateral walls, a roof and a floor. These walls all merge, and any exact division is impossible, but one may say that the anterior wall is formed by the posterior aspect of the septum and the choanae; the posterior, by the anterior arch and the anterior tuberosity of the atlas and the body of the axis; the lateral walls, by the lesser wings of the sphenoid; the roof, by the basilar process of the occipital bone, and the floor by the soft palate when it is raised. This cavity differs from the rest of the pharynx in that all of its walls are immovable, except the floor, so that the cavity cannot be obliterated. The pharyngeal adenoid lies in the posterior part of the roof and the upper part of the posterior wall, while on the lateral walls are found the openings for the eustachian tubes, and behind

them a slit-like groove or fossa known as the pharyngeal recess of Rosenmüller.

With the palm of the examining hand up, and with the examiner standing in front of the patient in such a position as to palpate the nasopharynx with the first finger of either hand, the first structure usually encountered by the examining finger is the postpharyngeal wall. Those with trained fingers usually slide to one side so as to allow the posterior aspect of the posterior tonsillar pillar to guide the upward thrust of the finger into the nasopharynx. In such an examination most of us are usually so intent upon what is to be felt in the upper reaches of the nasopharynx, the pharyngeal adenoid tissue, the ostia of the eustachian tubes and the choanae, that we fail to appreciate the size or the position of the tuberosity of the atlas which lies in the lower reaches of the space. It is usually to be felt a little below the level of the attachment of the velum palatae and jutting forward more or less from the postpharyngeal wall.

Our attention has been directed for a number of years upon the striking manner in which the tuberosity of the atlas is occasionally to be found thrusting itself forward and apparently encroaching upon the airway of the nasopharyngeal space. Curiously, this type of deformity, if deformity it is, is often accompanied by alterations in the height of the palatal arch. The narrow, crowded nasopharyngeal space is commonly accompanied by alterations in the palatal conformity. Further, in the presence of adenoid recession into the epipharynx there is usually to be palpated a marked increase in the prominence of the tuberosity of the atlas, and this, too, is often accompanied by alterations in the palatal arch, the variation usually taking the form of a narrowing of the arch and an apparent increase in its height.

Just why this tuberosity should at times thrust itself forward more prominently than is to be expected is not to be taken up here. The thing which stands out in our mind at the present time is that in considering departures from the normal, in the conformity of the nasopharyngeal space, one of the most striking features of this variation, namely, a change in the size of the atlas tuberosity, can and often does cause obstruction in the nasopharyngeal airway. We desire at this time to present

some elaboration of our findings in the study of this tuberosity.

Studies were made on atlas bones immediately available in the department of anatomy of the College of Medicine of the University of Cincinnati. Thirty bones were examined, all from adult skeletons. Marked differences in the size of the tuberosity were found, and photographic plates are herewith presented illustrating the marked variations in height which can occur in atlas bones of approximately the same weight and density of bone structure and which closely resemble each other in size. We desire to make no other point at this time than to stress the fact of this variation in bones of approximately the same size.

Further studies were carried on in the dissecting rooms. All the cadavers examined were bodies on which dissections were being carried on at levels lower than the region which we were studying. The mandibles were only partially movable, but, by the removal of some of the teeth, the postpharyngeal wall and the lower reaches of the nasopharynx could be directly inspected. In the present method of cadaver preparation all specimens have every orifice thoroughly packed with cotton or cloth, with the result that as the cadavers are inspected on the dissecting tables the tissues of the soft palate are drawn up and distorted, not only from the changes incident to death but also from the presence of packing which has been present for months. This distortion makes possible the direct inspection of the postpharyngeal wall at a much higher level than would otherwise be possible, and it is possible to see as well as to palpate the tuberosity of the atlas without having to lift the soft palate upward as one has to do in the living.

Digital examinations made on the living over a period of years have revealed that marked differences in the size of the tuberosity of the atlas can be palpated, and occasional cases have been found presenting an enlargement of the atlas tuberosity so marked as to give the impression that the airway must certainly be encroached upon.

Our cadaver examinations only stressed the point already made and offered further evidence that variations in size of the tuberosity of the atlas can be palpated. From those showing the most marked variations in this respect, two cadavers were selected in which the tuberosity could scarcely be pal-

pated and two showing a marked increase in its size. Direct inspection with the head mirror revealed that the differences were plainly visible, the two having almost impalpable tuberosities presenting an almost smooth postpharyngeal wall, while those presenting marked enlargement to the finger showed plainly visible moundings into the nasopharyngeal space. Photographs of casts made of the postpharyngeal walls of these cadavers are herewith presented, which substantiate the evidence given by palpation. The casts were made of Kerr's dental moulding compound and were not removed from the cadaver until the cast was completely hard. The smallest and most poorly developed cadaver of this group presented the largest tuberosity of the atlas, whereas the next largest tuberosity was found in a well developed, well nourished male of good size. The two small tuberosities were found in well developed cadaver specimens, one of which was a female.

Roentgenographic studies were also made of these four cadavers and lateral plates revealing the respective size of each tuberosity are herewith presented. All the plates, both of cadavers and on the living, were made at approximately the same distance and as nearly as possible in the same position. One of the difficulties encountered in bringing out the details of the tuberosity in lateral view is that the ray must pass through the dense structure of the mandible. The untouched plates made of both cadavers and the living show clearly the structures on which our present interest is centered. Owing, however, to the density of the mandible shadow and to the difficulties incident upon raying dead tissue, these plates had to be retouched before we could attempt reproduction for publication purposes. For this reason these plates are labeled semi-diagrammatic. Inspection and comparison of these plates again reveals the difference in the size of the tuberosity, as has previously been stressed.

Clinically we had encountered cases which, so far as we could determine, presented unobstructed and sufficient airway and in which the postpharyngeal adenoid tissue had either been cleanly removed or was so small as to be negligible, which yet could not get sufficient air either in or out of the nasal airway. By sufficient we understand that there was not sufficient air entering for comfort. Roentgenograms of two such cases

are here presented. Both cases presented marked increase in the height of the palatal arch with apparent narrowing, as well as some lack of dental symmetry. In spite of the fact that the nose was quite open and that there was no great effort needed to approximate the lips, these patients complained of not being able to get sufficient air through the nasal airway.

The most typical features of these cases is the muffled, flat voice which has no nasal resonance. It is not the type of voice typical of those who persist in faulty tone placing, nor have any of our cases presented pathologic changes of importance in the tissues of the larynx. Of the two cases which are here mentioned as examples, palpation of the nasopharyngeal space and inspection with the tilting mirror revealed marked enlargement of the tuberosity of the atlas, which thrust forward in such a manner as to apparently encroach upon the nasopharyngeal airway. We felt that there was every reason to believe that this enlargement was a very important factor, if not the most important factor, in the production of the flat, non-resonant voice so typical of these cases.

With the radiograms of the two cases just mentioned there are offered two plates of adult patients, who consistently breathe through their noses and who present no symptoms of nasal blockade. Comparison reveals a marked difference in size between the two tuberosities of nonsymptomatic cases and those of the two having difficult nasal respiration and lack of nasal resonance. Studies of many radiograms of these parts lead us to believe that the two plates presenting smaller tuberosities are those which more nearly approach the normal.

Our conclusions are as follows:

1. Clinically we do encounter patients suffering from difficult nasal breathing in which the nose is not entirely at fault and in which the pharyngeal adenoid is nonobstructive.
2. It is quite possible that the cause of this difficulty lies in variations in the morphology of the nasopharyngeal space.
3. Variation in the size and prominence of the tuberosity of the atlas does occur and must have some influence upon the size of the nasopharyngeal airway.

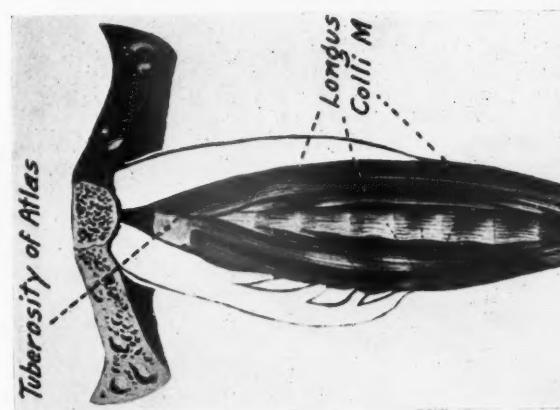
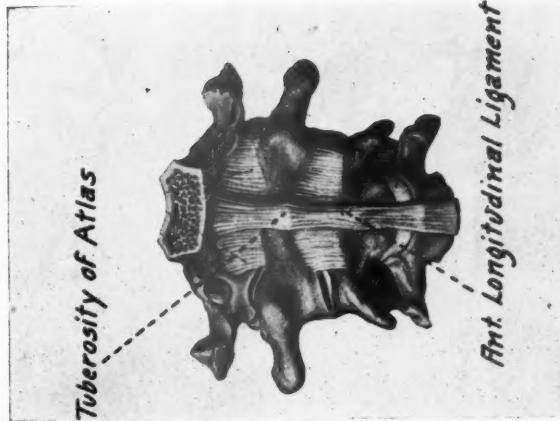


Plate 1—Lateral view of the cervical vertebrae in position. Tuberosity seen in outline.

Plate 2—Dissection showing attachment of the longus colli muscle to the tuberosity of the atlas. (After Cunningham.)

Plate 3—Dissection showing attachment of the anterior longitudinal ligament to the tuberosity of the atlas. (After Sobotta.) Plates 2 and 3 show how any enlargement of the muscle will carry forward all the muscular and ligamentous structures there attached. It will thus be seen how a relatively small increase in the size of the tuberosity can result in considerable reduction in the size of the naso-pharyngeal air way.

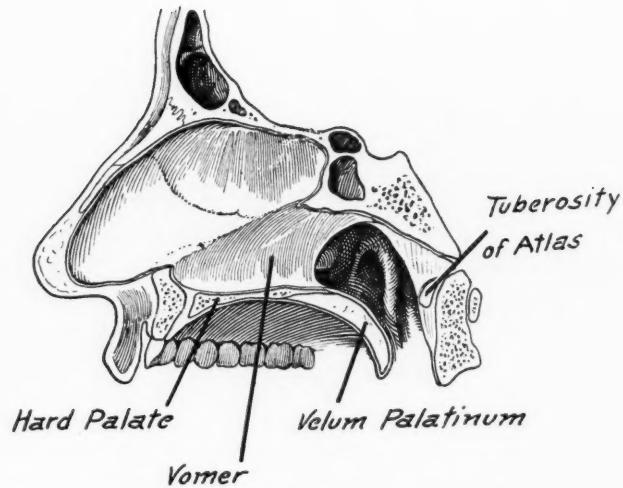


Plate 4—Hemisection of the head just clearing the septum. Note the relation of the tuberosity of the atlas to the attachment of the velum palatae and compare the level of the hard palate to that of the tuberosity. (After Corning.)

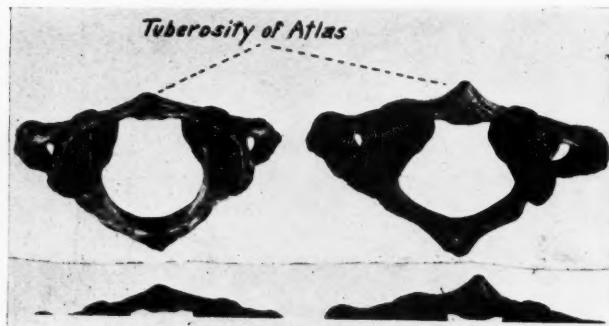


Plate 5—Two atlas bones of approximately the same size and weight. Presented to show the marked variations which can occur in the size of the tuberosity.

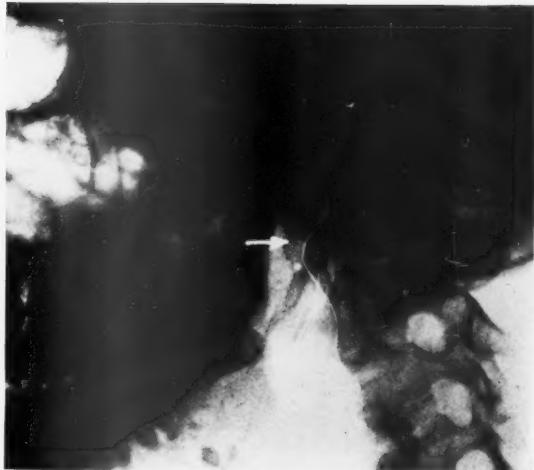


Plate 6—Semi-diagrammatic roentgenogram presenting small tuberosity. Patient a consistent nose breather.



Plate 7—Semi-diagrammatic roentgenogram presenting small tuberosity of the atlas. Patient a consistent nose breather.



Plate 8—Semi-diagrammatic roentgenogram showing large tuberosity. Patient presents distinct mounding of the tuberosity of the atlas into the naso-pharyngeal space which can be both seen and palpated. Has flat, non-resonant voice. Nasal respiration attended with discomfort.

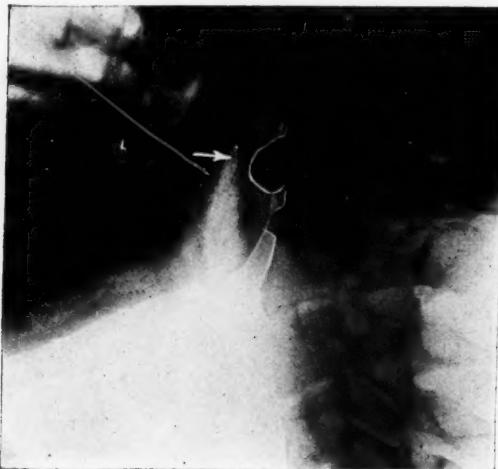


Plate 9—Semi-diagrammatic roentgenogram of the same type of patient. Note marked enlargement of the atlas tuberosity.



Plate 10—Semi-diagrammatic roentgenogram of cadaver specimen. Note marked enlargement of the tuberosity of the atlas. This enlargement could be plainly seen and palpated.

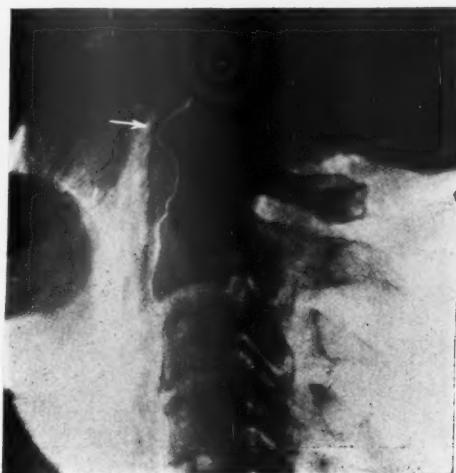


Plate 11—Semi-diagrammatic roentgenogram of cadaver specimen showing small tuberosity of the atlas.



Plate 12—Semi-diagrammatic roentgenogram of cadaver specimen showing large tuberosity.



Plate 13—Semi-diagrammatic roentgenogram of cadaver specimen showing small tuberosity.



Plate 14—Cast of the post-pharyngeal wall of cadaver shown in Plate 10.



Plate 15—Cast of the post-pharyngeal wall of cadaver shown in Plate 11.



Plate 16—Cast of the post-pharyngeal wall of cadaver shown in Plate 12.



Plate 17—Cast of the post-pharyngeal wall of cadaver shown in Plate 13.

LXV.

NASAL CALCULI.

BY FRED W. BAILEY, M. S., M. D., F. A. C. S.,

CEDAR RAPIDS, IOWA.

**Definition:** A nasal calculus is a foreign body formed within the nasal space by deposition of calcium salts. There is usually a nucleus, which may be a mass of inspissated mucus, a small stone, a button or some foreign body.

**Synonyms:** Rhinoliths, nasal concretions.

**Etiology:** Perhaps unknown but supposed to be due to some alteration in the character of the nasal secretion, such alteration causing favorable conditions for the deposition of some basic salts. The condition is found more commonly in adults than in children and more often in the female than the male.

**Site:** Nasal calculus may be found in any part of the nasal space, but is more commonly found in the lower part. There is no case on record where a bilateral concretion has been found, and no case on record in which there have been multiple concretions in one side of the nose.

**Characteristics:** Nasal calculi vary in shape and size from mere seedlike granules to large masses which reach the enormous size of an ounce or more in weight. In shape they vary so as to conform to the space in the nose in which they are formed. Their color ranges from a dirty gray to a brown, black or greenish tinge. In consistency they may be soft and crumbly, or they may be hard and brittle, and often resemble in shape and appearance the shell of an ordinary oyster. Chemically they are largely composed of calcium and magnesium salts, principally carbonate and phosphate, with traces of chlorid. There is often some organic substance mixed in with the calcium deposit.

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\*Read before the Sioux Valley Academy of Ophthalmology and Oto-Laryngology, January 19, 1925.

**Symptoms:** The symptoms of a nasal calculus are about the same as those of any other foreign body in the nose, except that they are less in severity. There is nasal discharge, which may be more or less foul, and there is occasional epistaxis, which comes on more frequently during the night, but is very rarely severe.

**Diagnosis:** The diagnosis is easy by inspection and palpation with a probe, but differentiation must be made from polyps which are beginning to calcify and necrotic bone.

**Prognosis:** The same as in any other foreign body in the nose.

**Treatment:** The treatment, of course, is removal of the calculus. In most cases this may be done under a local anesthetic, but when the calculus is large and the nose very sensitive it is best to employ a general anesthetic and may be necessary to break the calculus into bits in order to facilitate its removal. Great care, however, should be taken to prevent small bits of the calculus from entering the larynx. The after treatment consists of alkaline wash or douches until all inflammation has subsided.

#### REPORT OF CASE.

Mr. J. N., age 24, white, male, came to me on March 19, 1924, complaining of an obstruction in breathing on the left side of his nose, which was more noticeable when he had a cold. He stated that his nose would bleed from time to time and that he had had some slight discharge from the left nostril for the past six years. The bleeding attacks came on mostly at night. The discomfort, however, was not very marked, and the only reason he consulted me was because his family physician had told him he had better see someone to find out why he could not breathe through the left side of his nose.

The patient was born in Kerry, Ireland, and was raised upon a farm and worked there until eleven months before coming to the United States in 1921. These eleven months were occupied by employment in a London club. Since coming to America, he had been employed in an ice cream factory. He never had been ill except that he had had measles in April, 1921.

Examination of his nose revealed what appeared to be a polyp in the left nostril. The septum was deviated toward the right. In endeavoring to apply adrenalin and cocaine, preparatory to removing the supposed polyp, I noticed that the "polyp" did not seem to move and, on palpating it with a forceps, I found that it was a hard, gristy substance. I shrank the nasal chambers as much as possible with adrenalin solution and then grasped the body with a forceps, and after several attempts was able to dislocate it from the nose and remove it almost entire. However, five small fragments broke off the main body in the process of removal. The calculus, which I believed it at once to be, had the appearance and shape of an ordinary oyster shell. Its length was 28 mm.; width, 26 mm.; height, 6 mm. The weight was exactly 49.9 grams. The five fragments varied in dimensions from 4 mm. in length and 3 mm. in breadth to 14 mm. in length and 10 mm. in breadth. The calculus was covered by a foul smelling mucopurulent matter which had a very offensive odor. The nose bled about 1 dram after removing the foreign body. The appearance of the membranes in the nose was that of considerable hyperemia, but no abrasion or ulceration, this examination being made after the effects of the adrenalin had worn away. The patient made an uneventful recovery, and I have seen him several times since, but there is no tendency to a reformation of the calculus. I submitted the specimen to Mr. Milo Chehak, chemist, who made a careful chemical analysis of it, which is as follows:

"The chemical examination of the nasal concretion, often called a rhinolith, showed the mass to be composed of an amorphous substance, showing no crystalline structure under microscope. It consists of calcium salts of phosphorus with small amounts of calcium carbonate also present. The inorganic salts appeared to be cemented and mixed with vegetable fibers and inspissated mucus.

As only a small fragment of the concretion was obtained for chemical examination, its entire content could not be determined, as the mass was desired left intact for demonstrative purposes.

Approximately 50 per cent of the mass consisted of the tri-basic calcium phosphate with only small amounts of calcium

carbonate. It was soluble with difficulty in concentrated hydrochloric acid, quite readily in sulphuric acid, which decomposed the organic material present. The organic portion of the mass was difficult to determine, as bacterial decomposition had taken place, its original structure having been broken down.

It is most probable that a cross section of the mass would reveal a central nucleus from which it had increased to its present size. This nucleus would probably have an entirely different chemical structure from that of the outer layers. The outer layers showed large numbers of bacteria and pus cells, also fibrinous material from blood."

In searching the literature relative to nasal calculi, I was able to find only 49 cases reported in the last 15 years. Although nasal calculi may be fairly common, it is certain that they are not often reported.

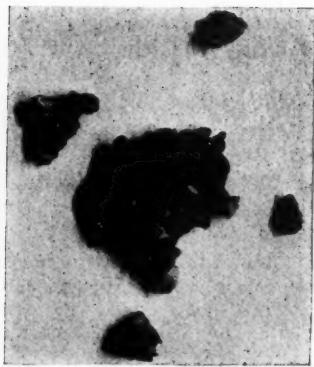
In the reports which I was able to find, Scott<sup>1</sup> describes a rhinolith which weighed 43 grains. Hadley<sup>2</sup> reports one which weighed 720 grains, but which was partly in the nose and partly in the nasal pharynx. Edward Bovin<sup>3</sup> of India reports one weighing 165 grains. Horcasitas,<sup>4</sup> a Spaniard, gives the report of a gigantic nasal calculus, but neglects to say what the weight of said calculus was. Calatrabino,<sup>5</sup> another Spaniard, reports a case of gigantic nasal calculus, but does not give the weight of same. Smith<sup>6</sup> reports one 22 by 48 mm.

The reason I report this case is that it is the first one of this nature which has come to my attention in twenty years of practice limited to diseases of the eye, ear, nose and throat, also because of the largeness of the calculus.

SECURITY BANK BLDG.

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Nasal calculus. Twice normal size.

LXVI.

MECHANICAL PROBLEM OF THE BRONCHOSCOPIC REMOVAL OF A PIN FROM THE RIGHT UPPER LOBE BRONCHUS UNDER FLUOROSCOPY—REPORT OF A CASE.\*

By I. D. KELLEY, JR., B. S., M. D., F. A. C. S.,

ST. LOUIS.

That the bronchoscopic removal of a pin from the right upper bronchus under fluoroscopy is a difficult problem and worthy of the most careful consideration is evident. Brüning states that it is doubtful if endoscopy of the upper lobe is of much value. Even Killian saw little use for upper lobe bronchoscopy except that it might be of value in determining the origin of tuberculous sputum. Chevalier Jackson has unhesitatingly stated that the extraction of foreign bodies from the upper lobe bronchi presents the most interesting problem in bronchoscopy because of the difficulty in obtaining lumen presentations of the foreign bodies. Fortunately, he says, it is exceedingly rare for foreign bodies to disappear wholly into the upper lobe bronchus. An additional interesting fact is that a painstaking survey of the bronchoscopic literature reveals not a single published instance of the removal of a pin from around the corner in the right upper lobe bronchus.

In considering the mechanical problem of removing a pin from this location it was borne in mind that the right main stem bronchus is more nearly vertical than its fellow of the opposite side, its deviation being approximately 25 degrees as compared to a 75 degree deviation of the left main bronchus. Therefore, anatomically it can be considered as a continuation of the trachea. Only by displacing the lateral wall of the right main stem bronchus below the carina with the bronchoscope can the orifice of the right upper lobe bronchus be brought into view, and because of the acute angle that the

\*Accepted thesis, candidate's admission to membership in the American Bronchoscopic Society, May 21, 1925.

right upper lobe bronchus bears to the right main stem bronchus its lumen image cannot possibly be seen. Consequently, a foreign body in the right upper lobe bronchus distal to its orifice is around the corner beyond the view of the bronchoscopic operator; therefore, an attempt must be made to remove a foreign body in this location, either blindly or with the aid of the fluoroscope, in an effort to obtain sight. Jackson states that fluoroscopic bronchoscopy is so deceptively easy from a superficial theoretic point of view that it has been used unsuccessfully even in cases easily handled in the regular endoscopic way. In twelve cases which he collected of foreign bodies where fluoroscopic bronoscopies were employed, the foreign bodies were removed in only eight cases. Five of the twelve cases were fatal within one week, and of the fatal cases the foreign bodies were removed in only three.

The difficulties of the foreign body problem proportionately increase when the foreign body is a pin, and especially when the head of the pin is found distally and the point downwards and nearest to the orifice of the right upper lobe bronchus. Lumen presentation of the foreign body in the case to be reported being impossible, it became necessary to employ Jackson's upper lobe forceps as a means of delivering the pin from its location around the corner. These forceps, the only instrument designed for this purpose, under the guidance of the fluoroscope, were used experimentally in an effort to solve this problem. Jackson himself questions the advisability of closing forceps by any other means than by the endoscopic guidance of the eye.

In my own hands I found the upper lobe forceps a dangerous instrument to use. Repeated attempts under fluoroscopy to remove from around the corner a pin which had been placed point downwards in the right upper lobe bronchus in a cadaver resulted either in transfixing the point in the bronchial wall (due to the ungovernable control of the traction employed in attempting to remove the forceps after the pin was engaged), or in the effort to engage it the pin was pushed upwards and outwards beyond reach. At other times it was observed under the fluoroscope that the forceps, as they ascended in the right upper lobe bronchus in an effort to reach

the pin, described an arc about its long axis, causing me to suspect that the rigidity of the blade obturators, advancing in an arc as they do, had forced the blade points through the bronchial wall, forming a false passage in the lung tissue. At autopsy this observation was found to be correct.

Fully aware that a metallic foreign body to ascend into the upper lobe bronchus must be propelled there by positive pressure, such as a violent cough or a topsy turvy position of the body, thus deflecting it from its usual descent into a lower lobe, the question of suction, aspiration or negative pressure, as a means of removing the pin, presented itself for consideration. Brüning advises against all methods depending on aspiration or suction in removing foreign bodies so long as there is any possibility of extraction by other means. He states, however, that a foreign body may be removed by suction in two ways. "If the foreign body completely obstructs the bronchus, pass an air tight bronchoscope down to it, and if the air is exhausted from the tube the foreign body should be sucked in if the bronchial tube were rigid, but it is not." The bronchial wall is sucked in as well, and by its lateral pressure holds the foreign body. The other maneuver consists in passing an aspirating tube right over the foreign body, but a complete vacuum could be seldom hoped for. Gottstein, he feels, suggested the only point in favor of pneumatic extraction or expulsion of foreign bodies when he recommended that a hollow hook should be pushed past the obstructing foreign body and air blown into the bronchus behind it. Brüning says even the value of this appears doubtful, and cites the perfectly obvious objections to its use.

Realizing the difficulties to be encountered in removing a pin from the right upper lobe bronchus with forceps, even before cadaver experimentation proved that it was practically an impossibility in this case, suction by means of the Lynah upper lobe suction tube occurred to me as the one possible means of drawing the pin downward into the main bronchus, where it could be grasped with a forceps and delivered under direct vision. The negative air pressure produced in the upper lobe bronchus through the accurate placing of the Lynah tube under fluoroscopy would, it seemed to me, more nearly simulate a direct antithesis to the force that created

the condition. If the point of the pin was not already trans-fixed in the bronchial wall, the even distribution of suction, exerting a diffuse uniform traction over the entire lumen of the bronchus at a given point, would cause the pin to move downwards and on a line exactly corresponding to its long axis, hope being entertained also that a sufficient mucous secretion might collect about the pin, which would act as a stopper, partially or wholly plugging the bronchus, thus augmenting the drawing force of the negative air pressure.

In this case, under the fluoroscope the Lynah tube was introduced through the bronchoscope and inserted into the right upper lobe bronchus until it approximated the point of the pin one inch beyond its orifice. Suction through the tube was then instituted and the tube slowly withdrawn, bringing with it the pin until its movement in a downward direction finally became arrested in the main stem bronchus, where it could then be seen and removed.

Kahler in a statistical report before the third International Laryngo-Rhinological Congress (Berlin), found recorded in the literature only five cases in which foreign bodies had been removed bronchoscopically before the year 1896. In 1900 the number of cases had increased to nineteen and in 1904 to thirty-six cases. From 1906, with 137 cases, they increased rapidly until they reached 595 in 1911. Since then the literature has fairly teemed with the reports of endoscopically removed foreign bodies from the air and food passages, but with only one mention of a case where suction was used for the removal of a pin. St. Clair Thompson, in a discussion of an article by Tod (Proc. Royal Society Med., 1916-17, Section on Laryngology, page 93), states that in removing a pin from a branch of the right middle lobe bronchus with forceps the pin was lost (had not been moved at all); that it was again seized and removed, together with the bronchoscope, and he considers that the suction created by removing the tube dislodged the pin and brought it up. Only one case report of the removal of a pin from around the corner in an upper lobe bronchus was found. This was a shawl pin, point buried, removed by Chevalier Jackson from the anterior branch of the left upper lobe bronchus in forty-two minutes and four

seconds (ANNALS OF OTOTOLOGY, RHINOLOGY AND LARYNGOLOGY, December, 1924).

The following case history, to my knowledge, is the first report of the removal of a pin from around the corner in the right upper lobe bronchus by endoscopic means.

Case Report.—C. C., age 12 years, entered St. Louis City Hospital (No. 10193. Record 186-246), December 8, 1924, complaining of swallowing a pin at 6 p. m., after her evening meal, on December 8, 1924. The only symptom was pain in the throat on swallowing. X-ray shows pin in anteroposterior position above and in the center of the larynx at the level of the fifth to sixth cervical vertebrae. Following manipulation (attempted removal) under anesthesia, patient lost consciousness of pain on swallowing. Radiogram then showed pin in the right upper lobe bronchus.

December 9, 1924. At the request of the hospital physician in charge, I was asked to see this case, and after a study of the X-ray plates, history, etc., the case was posted for a diagnostic bronchoscopy the following afternoon at 2 o'clock.

December 10, 1924. Patient showed no symptoms referable to pin. At 1:45 p. m. patient was taken to operating room for bronchoscopy.

Bronchoscopy (operative notes). City Hospital, December 11, 1924:

Diagnosis: Pin in upper lobe bronchus (point downwards and inwards, head towards apex of lung).

1:30 p. m. Patient given morphin sulphate, gr.  $\frac{1}{4}$ , atropin, 1/200, hypodermically.

1:45 p. m. Arrived in bronchoscopic room prepared for bronchoscopy.

1:55 p. m. Ether anesthetic administered to analgesic stage.

2:00 p. m. Bronchoscopy commenced. Introduction of laryngoscope followed by laryngeal suction. Insertion of No. 6 mm. bronchoscope into right main stem bronchus. Careful inspection of lower middle and upper lobe bronchial orifices showed no presence of pin; likewise main stem bronchus and trachea free from foreign body. Painstaking effort made by changing position of patient and manipulation of lips of tube to inspect upper lobe bronchus. Bronchoscope removed. Time,

20 minutes. Patient experienced no untoward discomfort. X-ray of chest showed pin in same position.

Operators I. D. Kelley, Jr., and E. Lee Myers. Head holder: D. P. Ferris. Shoulder holder, interne. Assistants, nurses and anesthetist. No untoward symptoms following bronchoscopy.

December 14, 1924. Patient developed acute follicular tonsillitis, maximum temperature 103.4 degrees. Chest findings normal. Temperature and throat conditions gradually returning to normal.

December 18, 1924. Throat and general condition now normal. At 2 p. m., patient taken to fluoroscopic room for fluoroscopic bronchoscopy.

Bronchoscopy (operative notes), City Hospital, December 18, 1924. C. C., 12 years:

Diagnosis: Pin in right upper lobe bronchus (point downwards and inwards, head towards apex).

1:45 p. m. Patient given morphin sulphate, gr.  $\frac{1}{4}$ , atropin, 1/200, hypodermically.

2:10 p. m. Arrive in fluoroscopic room. Prepared for bronchoscopy on fluoroscopic table.

2:18 p. m. Ether anesthetic administered to analgesic stage.

2:23 p. m. Bronchoscopy commenced. Introduction of laryngoscope followed by laryngeal suction. Insertion of No. 7 mm. bronchoscope into right main stem bronchus. Right upper lobe bronchus brought into view at distal end of bronchoscope and demonstrated in fluoroscopic examination. Lynah suction tube inserted into bronchoscope and passed into the upper lobe bronchus until fluoroscope showed suction tube to be in apposition to point of pin. Suction was started, followed by the immediate slow withdrawal of Lynah tube into main stem bronchus. Under the fluoroscope the pin was seen to follow in a downward and inward direction the suction tube for approximately one inch, when it remained stationary while the distal end of the suction tube passed into the bronchoscope. The Lynah tube was withdrawn from the bronchoscope, and the shaft of the pin was seen in direct vision at the distal end of the bronchoscope in the right main stem bronchus, in a direction from above downward and inward, corresponding to the direction of the upper lobe bronchus. A me-

dium sized fenestrated forward grasping forceps was then introduced into the bronchoscope and the pin grasped at its point and removed through the tube. Bronchoscope removed. Time, six minutes.

Patient experienced no untoward discomfort. Immediate X-ray of chest and abdomen showed no presence of foreign body. Lungs normal.

Operator: I. D. Kelley, Jr. Head holder, E. Lee Myers. Shoulder holder, D. P. Ferris. Fluoroscopic operator: Leroy Sante. Anesthetist, assistants and nurses. Visitors: Dr. Jordan, Hospital Commissioner; Dr. Scharff, Superintendent City Hospital.

December 19, 1924. Discharge Note.—Temperature normal for last three days. No pain or discomfort from bronchoscopic manipulation.

The fluoroscope used in this fluoroscopic bronchoscopy was not the double plane fluoroscope devised by Dr. George W. Greer and advocated by Dr. Chevalier Jackson. This fluoroscope was available, but at the request of the hospital roentgenologist, Dr. Leroy Sante, a different instrument was used, and his reasons for preference are expressed in the following report written by him at my request:

"The rôle of the X-ray in the bronchoscopic removal of foreign bodies from the lungs is to serve as a guide for the operator in the manipulation of the bronchoscope and the bronchoscopic instruments. Working blindly, as the operator necessarily does, the X-ray is of aid in determining for him the position of the lower end of the bronchoscope in relation to the foreign body. The radiologist can tell when the bronchoscopic instrument enters the bronchus in which the foreign body is lodged. This can be accomplished in two ways. The first and most desirable method is by the use of fluoroscopic examination in two planes at right angles to each other, secured by examination from an X-ray tube beneath the table and a second X-ray tube mounted on the side to give simultaneous fluoroscopy in the lateral view. In this way a foreign body can be accurately localized in its relationship to the bronchoscopic instrument. While this method is usually the most satisfactory, it will be found impossible to use it in upper

lobe cases, since the shoulders obstruct so greatly that clear lateral vision is impossible.

A simple method to determine the relative position of the bronchoscopic instrument and foreign body, and one available to all radiologists, is a utilization of the parallax method of foreign body localization. The farther away an object is from the fluorescent screen, the greater the movement of the image of the foreign body on the screen with displacement of the tube; the nearer the foreign body to the screen, the less the movement of the image with change in position of the tube. If two foreign bodies move equally on the fluoroscopic screen with the displacement of the X-ray tube they must be on the same plane. If the end of the bronchoscopic instrument and foreign body are on the same plane their images will move together on the screen; when the X-ray tube is displaced it can be safely asserted that they are in the bronchus. In this instance the Lynah tube was located in the same bronchus with the pin by this method. On applying suction with the tube in place, the pin was seen to move fully an inch from its previous position, with the point of the pin extending into the suction tube. By withdrawing the suction tube the pin was pulled into position across the end of the bronchoscope, but could not be pulled beyond this point. With the pin in direct bronchoscopic vision it was readily removed with grasping forceps."

It gives me pleasure finally not only to express my appreciation of the valuable aid given to me in this case by Dr. Sante and his staff of radiologists, but I must give to my associate, Dr. E. Lee Myers, the highest praise for his efficient aid and cooperation, both during the bronchoscopies on the patient and during the experimental fluoroscopic bronchoscopies on the cadaver.

1222 MISSOURI THEATRE BLDG.

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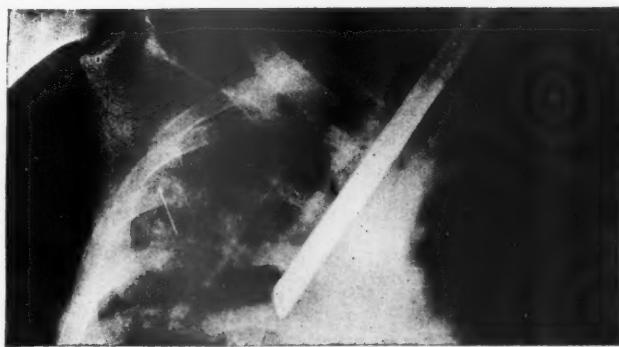


Illustration No. 1—(Experimental). Pin pushed to periphery of lung in an effort to grasp it with Jackson's upper lobe forceps.

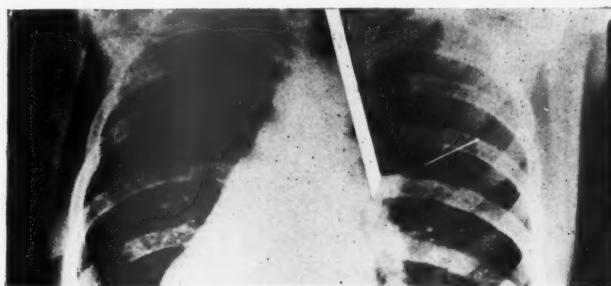


Illustration No. 2—(Procedure). Bronchoscope in position with orifice of right upper lobe bronchus in view of the operator.

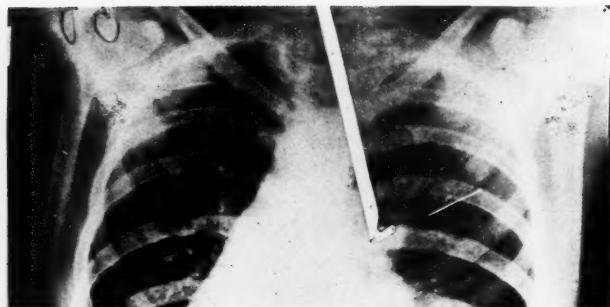


Illustration No. 3—(Procedure). Lynah suction tube emerging from end of bronchoscope and being inserted into right upper lobe bronchus.

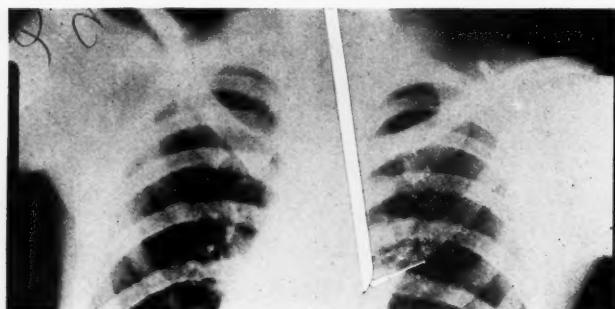


Illustration No. 4—(Procedure). Pin following Lynah suction tube downwards from its position in upper lobe bronchus.

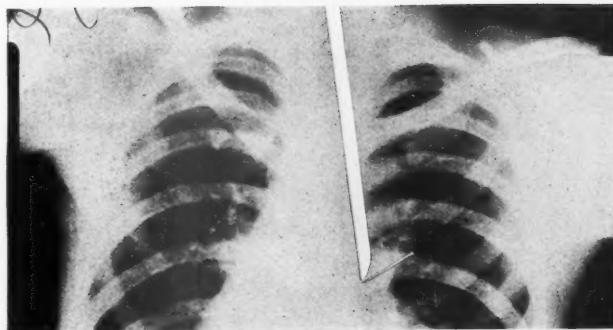


Illustration No. 5—(Procedure). Pin in apposition to end of bronchoscope following removal of Lynah suction tube.

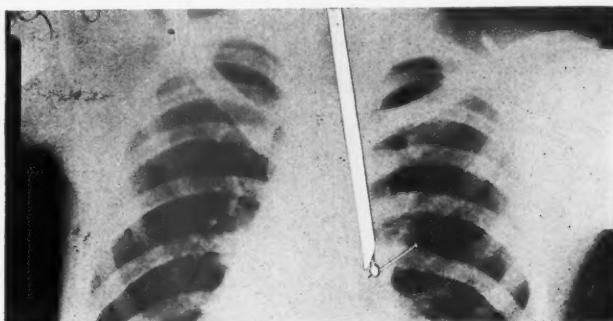


Illustration No. 6—(Procedure). Forward grasping forceps fixed on point of pin ready to remove it from right main stem bronchus.



Illustration No. 7—December 9th, 1924. Pin in glottis. Antero-posterior view.

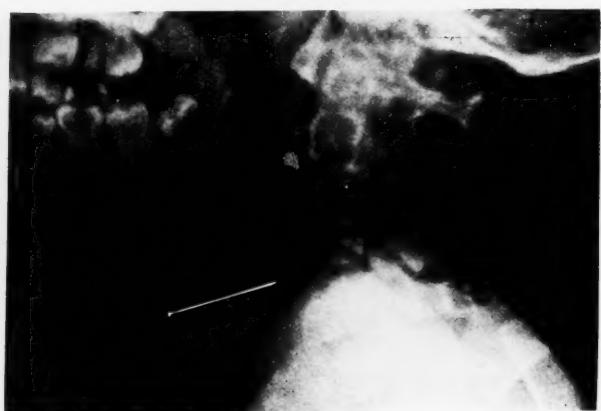


Illustration No. 8—December 9th, 1924. Pin in glottis, lateral view.

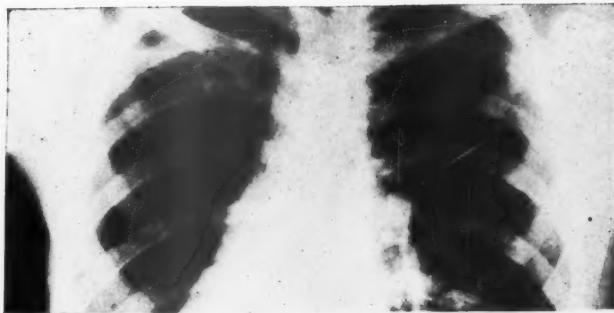


Illustration No. 9—December 10th, 1924. Pin in right upper lobe bronchus. Antero-posterior view.



Illustration No. 10—December 10th, 1924. Pin in right upper lobe bronchus. Lateral view.



Illustration No. 11—December 11th, 1924. Pin in right upper lobe bronchus, following diagnostic bronchopy December 10th, 1924.

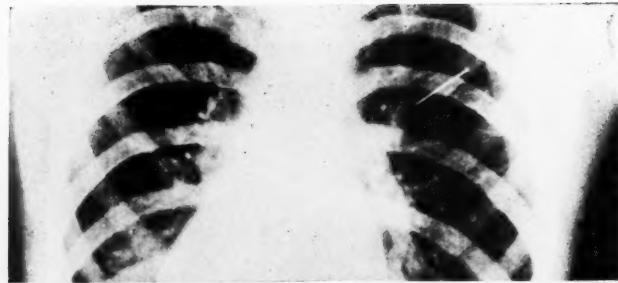


Illustration No. 12—December 15th, 1924. Pin position unchanged.



Illustration No. 13—December 18th, 1924. Immediately after removal of pin. Chest normal.



Illustration No. 14—January 12th, 1925. Check on lung condition.

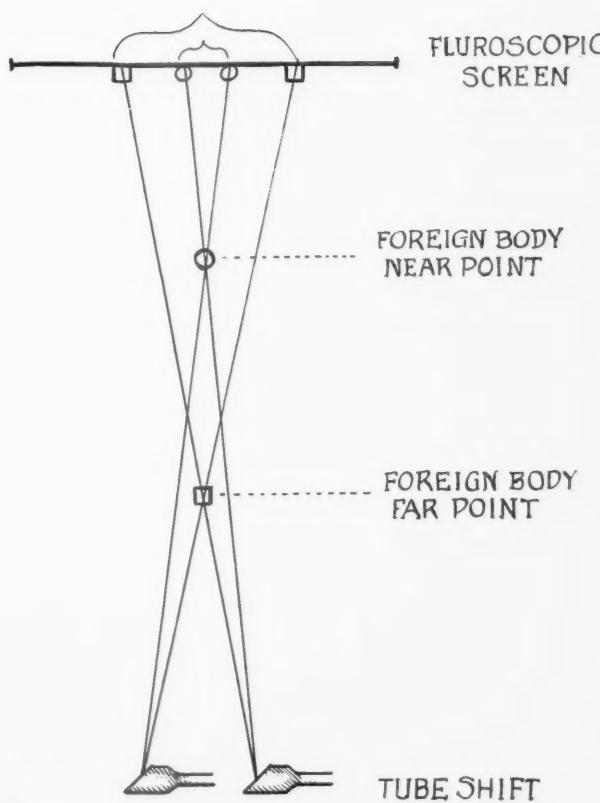


Illustration No. 15—Schematic drawing showing method of fluoroscopic foreign body localization employed in removing pin.

LXVII.

A REVIEW OF RADIOTHERAPY FOR CHRONIC  
TONSILLITIS.\*

BY JAMES W. BABCOCK, M. D.,  
NEW YORK.

The great increase in the application and field of usefulness of radiotherapy has been a matter of interest to the profession and laymen alike. As with all comparatively new things, enthusiastic expectation at times outruns actual possibilities. In the application of this potent and still not completely understood agent to the treatment of chronic tonsillitis, one can find a great diversity of opinion as to its value. It has been a matter of interest to me for several years, and in attempting to get at the actual basis of fact, I offer a resumé of what opinions have been published and my personal observations. In all I have reviewed forty-nine articles touching on the subject which have appeared in the past three or four years. Twenty-eight of these articles, or 57 per cent, are heartily in its favor; eleven, or 22 per cent, find it of limited but distinct value, and ten, or 20 per cent, find it of little or no use.

The factors in its favor are as follows:

Radiotherapy avoids the undoubted, although small, operative risk of tonsillectomy, such as is present whatever method is used or under whatever anesthesia the operation is performed. It reduces the size of the tonsil by a diminution in the lymphoid tissue with a relative, if not an actual, increase in the connective tissue. Claims for this point vary from a 50 per cent reduction to an actual disappearance of the tonsil (Simpson). Other claims are more ambiguous, stating that tonsils return to normal size (Herrman). The normal size is not stated, and but few have attempted the difficult, if not impossible, task of actually measuring the tonsil *in situ*, being content to judge from the amount of tonsil tissue projecting beyond the anterior pillar. The relative amount and function of the lymphoid and

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connective tissue in the tonsils is touched upon. After treatment they are said to have assumed the appearance of health and seem capable of functioning normally (Bryon, Sprague, Price). Denman states that only infected lymphoid tissue is cleared up, leaving other useful fibrous structures intact.

The chief interest in chronic tonsillitis centers upon the rôle of an infected tonsil as a focus of infection. This is said to be eradicated, not by the bactericidal effect of the rays themselves, but by the widening and lessening of the depth of the crypts and their ceasing to harbor pathogenic bacteria in consequence. Witherbee reports cases showing from 50 to 100 colonies of streptococci in the secretion expressed from the tonsil before one roentgen ray treatment, and the growth of none from a culture made two weeks later. Little is said about the effect on the remote parts involved in chronic tonsillitis, such as joints and heart. Herrman does say that in practically every case there was gain in weight, improvement in cardiac and nervous conditions and less susceptibility to colds.

Radiotherapy is said to be without attendant dangers. Van Allen has observed no apparent effect on the salivary glands.

The time and technic of treatment advocated varies. Simpson is positive he can cause complete atrophy and disappearance of any tonsil in from one to three treatments. Witherbee at one time stated that final results of roentgen ray treatment of the tonsils can be determined in any given case only after eight exposures have been made at two week intervals, and two months have elapsed after the eighth treatment. An earlier statement advised a minimum of four treatments at two week intervals, and favorable results were observed before the completion of the treatments.

The favorable effect upon adenoids and other collections of lymphoid tissue in the pharynx, much of which is difficult to remove surgically, has been dwelt upon.

Radium has its advocates, the effect being equal if not superior to that of X-rays, and it is said to be more adaptable to precise application, which seems reasonable.

The eleven articles finding radiotherapy of limited value practically concur in the opinion that it should be used only

in cases for whom an operation is definitely contraindicated.

In the papers denying the usefulness of radiotherapy in chronic tonsillitis we gather the following opinions:

Most concede that the size of the tonsils seems reduced, at least temporarily. This is a difficult thing to judge with accuracy, especially when we consider that the size of the tonsil varies greatly with the degree of inflammation present in it. We must also consider that the damage done by a diseased tonsil is far from being dependent on its size alone. The relative amount of lymphoid and connective tissue in tonsils is hard to compute mathematically, but that the lymphoid tissue does not disappear or obviously diminish is shown in the cases reported below. Lane states that the tonsil has a function to perform, and care should be taken to preserve it, especially in childhood. No function, except that of a very much exposed portion of the lymphatic defense of the body, has ever been demonstrated, and if radiotherapy removes the lymphatic portion, leaving only scar tissue, what becomes of any suppositional endocrine function?

The freeing of the tonsils from pathogenic bacteria is not accepted by all. Ullmann and Nuzum, in a series of 218 pairs of irradiated tonsils, found hemolytic organisms in 96.1 per cent; a year earlier Nuzum reported that X-ray therapy was effective in reducing the size of the tonsils in 16 per cent of his cases, and hemolytic streptococci were permanently removed in but 50 per cent. The method of freeing the tonsils of bacteria by widening the crypts was not shown in the cases reported below. As for benefit on associated lesions, Shurly states that unless the tonsil can be sterilized it remains a menace to the system. Lederer finds that in no case were many marked changes observed, and only in children with typical hypertrophied tonsils was even a slight change in size observed. Patients with chronic tonsillitis were benefited for a time, only to have recurrence. Waters, MacCready and Hitchcock state that there is no evidence that reduction in the size of tonsils by irradiation is accompanied by eradication of the carrier state in individuals harboring the hemolytic streptococcus in these tonsils.

As to the possible dangers of radiotherapy, dryness of the mouth has been observed (Babcock), apparently due to loss of

activity of the mucous secreting glands in the oral mucosa, rather than that of the salivary glands. Unless all precautions are taken, burns or baldness are quite possible. I have observed baldness after the mere exposure for roentgenographs of the nasal accessory sinuses and even the teeth.

The most important danger, to my mind, lies in the protracted course of treatment, even though perfect results were sure to follow it. It is a serious thing, as Lederer and Rott have pointed out, to ask a patient to wait six months to determine the results of a course of treatment when his usefulness, comfort or even his very life may be threatened by arthritis, endocarditis or nephritis, and a tonsillectomy can remove the focus of infection promptly. The authors vary considerably among themselves as to the exact technic and length of treatment desirable.

Ullman and Nuzum make the interesting observation that no relationship between clinical and bacteriologic results were observed. Some patients whose throats had become free of streptococci said they could detect no difference; others who still harbored pathogenic organisms were pleased with the results.

Trinder made some very valuable observations by removing one tonsil in a series of thirteen cases with recurrent sore throat and in many instances symptoms of an infective focus, and subjecting the remaining tonsil to X-ray treatment, consisting of from five to ten exposures. The tonsil so treated by X-ray was removed six months later and examined. It was found that there was no increase in fibrosis, but some vacuolation of the cells of the mucosa with apparent widening of the crypts. The lymph follicles showed no reduction in size, and there was no apparent reduction in the amount of lymphoid tissue present. The apparent reduction in the size of the tonsils treated by X-ray was found on removal to be due to a retraction of the organs into the fossæ and behind the pillars rather than a decrease in size by actual measurement. He was, however, favorably impressed by the results of X-ray treatment in chronic tonsillitis and found all but two of 76 patients had marked relief of symptoms, both focal and local.

Report is made of ten cases occurring in the practice of Dr. C. G. Coakley and myself, which cover many of the points under consideration.

**Case 1. History and Operation.**—Mr. P. H. B., age 29, had had several attacks of tonsillitis and one of quinsy. There were intermittent symptoms of toxic absorption, chiefly of the gastrointestinal tract. Six roentgen ray treatments of the tonsils, at two week intervals, were given in the winter of 1921. The quinsy occurred six months later. The tonsils were removed under general anesthesia, October 11, 1921, with smooth convalescence. When the patient was seen, four months later, the general symptoms were improved, and there were six or seven scattered lymph nodules on the posterior pharyngeal wall.

**Pathologic report:** The epithelium covering the tonsils, where present, was unusually thick. The germinal layer of dark staining cells was thicker than usual and sharply demarcated from the superficial cells. Lymphoid tissue was abundant. Germinal centers were large and contained many mitotic figures. Connective tissue septa and capsule were slightly infiltrated with lymphocytes. There was no increase of connective tissue in or around the tonsils. The crypts contained cornified epithelium and lymphocytes.

**Bacteriologic report:** Cultures were taken from the center of the tonsils after careful incision with a sterile knife, and streptococcus viridans was found in both of them. In one of them, staphylococcus albus was also present.

**Case 2. History and Operation.**—Mr. W. A. B., age 57, had had frequent colds, sore throat and sinusitis. He received twelve roentgen ray treatments of the tonsils from March to September, 1922. No improvement was noted, and a thin secretion remained in the tonsil crypts. Tonsillectomy was performed, October 5, 1922, under local anesthesia, with smooth convalescence.

**Pathologic report:** The crypts were rather large and contained epithelial cells mixed with lymphocytes and polymorphonuclear leucocytes. Surrounding the crypts was a moderate amount of lymphoid tissue with germinal centers. At the periphery of the lymphoid tissue, extending diffusely into the adjacent fibrous tissue, were numerous plasma cells, with a

moderate number of lymphocytes and a few eosinophils. Broad bands of connective tissue passed through the tonsils, separating the regions of the crypts with their adjacent lymphoid tissue into what appeared as islands. This was probably only a relative increase of fibrous tissue, due to condensation from loss of lymphoid tissue. There had evidently been a marked decrease in lymphoid tissue, which it did not seem possible to ascribe to treatment, unless the tonsils were known to be distinctly hypertrophic before roentgen ray exposure. If there had been any necrosis of lymphocytes from the roentgen ray it is possible that the dead cells and nuclear fragments would have been completely removed in the two months which had elapsed since the last treatment.

Case 3. History and Operation.—Mr. B. L. S., age 56, suffered rheumatic pains, especially in the shoulders. He also had diabetes. The tonsils were large, with buried crypts. Roentgen ray treatment of the tonsils was given July 15th and August 10th and 25th, 1920. October 25th, the tonsils seemed slightly smaller, but the crypts still contained a secretion which showed streptococcus viridans and staphylococci on culture. The pains in the shoulders persisted. November 8, 1922, the patient was still having attacks of arthritis; the tonsils were moderately large, and there were buried injected pillars and crypts yielding a thin secretion. There was no glycosuria. Tonsillectomy was performed, November 14th, under general anesthesia. Convalescence was smooth and the pain in the shoulders improved.

Pathologic report: The tonsils were covered with normal epithelium. They were surrounded by thick capsules of dense fibrous connective tissue. The crypts were not dilated, and most of them were comparatively free from evidence of infection. One crypt, however, contained a small amount of pus, and the wall was infiltrated with leucocytes. The lymphoid tissue was moderate in amount and contained many distinct germinal centers. The change appeared to be, in part at least, what might be expected in a man 56 years of age; slight atrophy of lymphoid tissue and relative fibrosis. Inflammation may have been a factor, but the present evidence of infection was slight. Apparently, there was no change which could definitely be ascribed to roentgen ray treatment.

Case 4. History and Operation.—Mr. R. G., age 50, suffering from malaise, loss of weight and anemia, suggesting malignant endocarditis, but no positive evidence of this was obtained. The tonsils were suspected, as the crypts contained thin pus, and were treated eight times by roentgen rays at two week intervals during the fall of 1921. No change was noted except some sore throat, a week or ten days after each treatment. Cultures of the tonsils taken July, 1922, showed only staphylococci; but thin pus was still present in the crypts. Tonsillectomy was performed, July 17th, under local anesthesia, with smooth convalescence. Two months later the patient had gained twelve pounds (5.5 kg.) and was greatly improved in appearance and vigor.

Pathologic report: The tonsils were covered with stratified squamous epithelium, which showed no abnormal change. The crypts were large and contained many polymorphonuclear leucocytes, clumps of bacteria and desquamated epithelial cells. The walls of the crypts were in places densely infiltrated with leucocytes. The crypts were surrounded by a moderate amount of lymphoid tissue, with numerous distinct germinal centers. At the periphery of the lymphoid tissue, extending for a variable distance into the connective tissue, were large numbers of plasma cells, with a few polymorphonuclear leucocytes and eosinophils. The tonsillar tissue was surrounded by a thick connective tissue capsule, and several septa of connective tissue separated the masses of lymphoid tissue which surrounded the crypts. There was no definite "scarring" of the tonsils.

Case 5. History and Operation.—S. B., a youth, age 17, had had chronic cardiac valvular disease since childhood. He was undersized and underweight and had had chorea and frequent tonsillitis, but no attack in the last three or four years. The tonsils had been treated by roentgen ray five times, eighteen months before. No improvement was noted. The tonsils and a moderately large mass of adenoids were removed, May 3, 1922, under general anesthesia, with smooth convalescence. Six months later the patient had made a marked gain in weight, strength and activity. Cultures showed streptococcus viridans in great numbers in both crypts and tissue, and a few hemolytic streptococci in the crypts.

Pathologic report: The tonsils showed abundant lymphoid tissue with numerous germinal centers. The crypts were not enlarged and contained only a few lymphocytes and red blood cells. There was no fibrosis.

Case 6.—Mrs. E. W. C., age 38, underwent incomplete tonsillectomy in Chicago in 1919, a portion of the lower pole being left in the right fossa. Three treatments by roentgen ray failed to produce any appreciable change in this tissue, which was periodically inflamed, in association with colds resembling vasomotor rhinitis. The remainder of the right tonsil was removed May 26, 1922, with apparent cure to date.

Case 7.—Mr. C. Z., age 23, had had malaise and irregular slight fever four or five months, when first seen in February, 1920. Occasionally he had sore throat. The tonsils were moderately large and buried, with cheesy secretion in the crypts. There was no cervical lymphadenitis. Two treatments by roentgen ray were given in April, 1920. In December, the patient felt somewhat improved; the tonsils seemed smaller, but still contained thick and thin secretion in the crypts, showing streptococcus viridans and staphylococcus aureus. The cervical lymph nodes were now palpable. Symptoms recurred and the tonsils were removed in the fall of 1921. The patient has been well since.

Case 8.—W. P. E., a youth, age 17, had had several attacks of acute rheumatic fever with endocarditis. The tonsils and adenoids were removed in 1915. The patient suffered attacks of rheumatism, with cardiac involvement, in 1918 and 1921, and a fatal attack occurred in 1922. He was in fairly good shape between attacks. He had considerable lymphoid tissue on the posterior pharyngeal wall, which became acutely inflamed at intervals. This was treated by five roentgen ray treatments during the early spring of 1921 and one in the fall of 1921. The attack in 1922 came on subsequent to roentgen ray treatment. This also showed no appreciable effect on the pharyngeal lymphoid tissue, which became acutely inflamed with his attacks of rheumatism.

Case 9.—I. M. F., a boy, age 11, had three operations on the left mastoid at the age of two, and there had been occasional discharge since. There was frequent acute rhinitis. An early

operation on the tonsils left a small portion of the right tonsil. There was great hypertrophy of the lymph nodules on the posterior pharyngeal wall. He received several treatments by roentgen ray between November, 1920, and March, 1921, without any change being noted except that which occurred before roentgen ray treatment, in that the tissue was more swollen when inflamed than when not inflamed. Colds and attacks of pharyngitis have persisted to the present. The ear, however, does seem improved, but it is hard to tell whether the roentgen ray benefited this or not.

Case 10. History and Operation.—Master John M. W., age 14, was first seen February 27, 1922. He had a cold and talked thickly, with acute inflammation of adenoids and very large tonsils. He had frequent colds and sore throats. He received eight treatments of his tonsils and adenoids by X-ray on March 21, April 4, 15 and 29, May 13 and 27, June 6 and November 14, 1922. December 22, 1922, he showed acute rhinitis, tonsils still large; some secretion in the crypts, right, and a moderate mass of adenoids. December 28, tonsils seemed reduced in size about 20 per cent. December 30, the culture from the left tonsil showed a growth of streptococcus viridans and staphylococcus aureus. The culture from the right tonsil showed a growth of streptococcus viridans and pneumococci. January 15, 1923, tonsillectomy and adenoidectomy was done under general anesthesia. The tonsils were large, buried, rather fibrous, and secretion was present in the crypts. They were rather adherent and difficult to separate from the surrounding tissues. There was considerable lymphoid tissue in the midline of the nasopharynx and extending down behind the posterior pillars. Rosenmüller's fosse were fairly free except for some adhesions. The palate was exceptionally dry, only a little sticky mucus being secreted during operation.

Microscopic examination: Both tonsils were large, the right being somewhat bigger than the left. They were covered with normal stratified squamous epithelium. The crypts were large and wide, and were lined by epithelium which appeared thicker than usual. Some of the larger crypts contained masses of fungi and bacteria, others were empty. Some of the smaller branches of the crypts were filled with desquamated epithelial cells, polymorphonuclear leucocytes and small masses of

bacteria. The lymphoid tissue was abundant, and the germinal centers large and numerous. The germinal centers were less cellular than usual and showed an increase in reticulum. Mitotic figures were present in moderate numbers. The connective tissue framework showed no alteration. The fibrous capsule and septa were not thickened. There was no increase in connective tissue throughout the tonsils. The adenoid tissue was abundant. It showed a more diffuse lymphoid hyperplasia than the tonsils. The crypts were small and showed nothing abnormal.

Bacteriologic examination: The tonsils were held for a short time in boiling water and then placed in a sterile dish and opened with sterile instruments. Cultures were made with a platinum loop from the deeper parts of the crypts and middle of the tonsillar tissue. Cultures on blood agar plates showed numerous colonies of hemolytic streptococci from both tonsils. The right tonsil also showed colonies of staphylococci and the left an unidentified Gram positive bacillus. Cultures in bouillon from both tonsils showed chiefly streptococci. No culture was made from the adenoid tissue.

It is difficult to draw definite conclusions as to the value of radiotherapy in chronic tonsillitis from such varied testimony. We are all prone to place more dependence on our own observations than on those of others. However, we cannot ignore the findings of careful investigators, such as Trinder, who considers X-ray therapy of value. On the other hand, much of the comment favorable to X-ray therapy impresses one as being enthusiastic but not well controlled by careful observation. My own observations lead me to conclude that radiotherapy, in chronic inflammation of the lymphoid tissue of the pharynx and nasopharynx, does not—

1. Cause a disappearance or fibrosis of this tissue.
2. Render the crypts of the tonsil free from pathogenic bacteria.
3. Relieve the patient of acute local inflammation or the more remote symptoms due to absorption of toxins or bacteria from the tissue in question.

Since it does not accomplish the effects chiefly desired, it cannot take the place of adequate surgical treatment. If there

be definite contraindications to any surgical procedure, and those are very few, it may be considered as a treatment of decidedly second choice.

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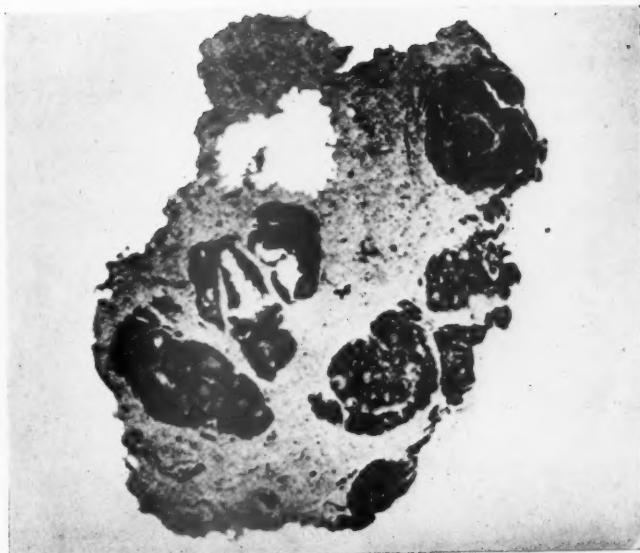
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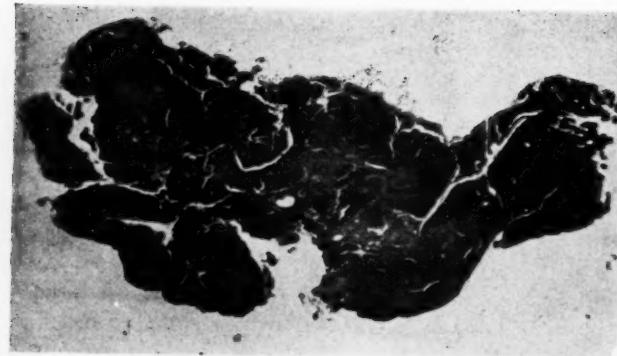
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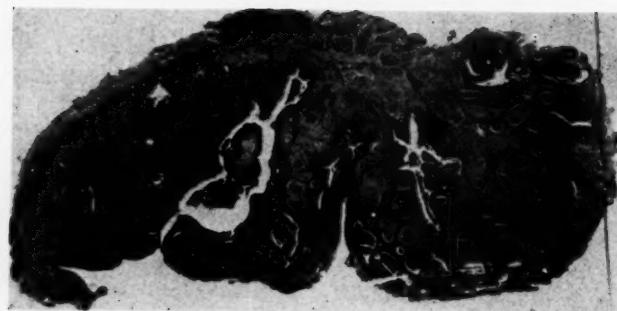
Section of X-rayed tonsil, published by Dr. Witherbee.



Case 10—J. W., crypt, left tonsil, high power.



Case 10—J. W., part of adenoids,  
low power.



Case 10—J. W., right tonsil,  
low power.



Case 10—J. W., left tonsil,  
low power.

## LXVIII.

### VERTIGO WITH ESPECIAL REFERENCE TO FUNCTIONAL VERTIGO.

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Within the past fifteen years vertigo or dizziness as a symptom has been given more attention by the clinician and more space in the literature than almost any one single symptom, especially in relation to the pathology of the internal ear, the cerebellopontine angle and the cerebellum has been emphasized by the aurist, the neurologist and the neurologic surgeon. It is a symptom like pain in general or headache in particular. It is a subjective symptom which may be played up by the patient or passed over as of no great moment. It differs from many subjective symptoms, however, in that the apparatus of equilibrium can be tested and studied as to its integrity. By this study organic changes in the apparatus may be detected. This establishes objectively the basis for the subjective symptom.

The physiology and microscopic anatomy of the end organs, nuclei and paths have been subjected to research and study in all lands, in many clinics and laboratories. The theories and conclusions of authoritative writers are at variance. Whether a dependable diagnosis of organic pathology may be consistently made by the various tests of turning, of douching, of galvanism and by these alone is as yet a moot question. In arriving at the final diagnosis it is necessary to study the various cranial nerves, the fundus oculi and other contributing data. The progress in diagnosis of the organic lesions will doubtless proceed under the stimulating contributions of many observers. There are, however, myriads of patients who complain of vertigo as a more or less annoying symptom, in whom no organic lesion can be suspected.

A careful study of the equilibrium apparatus reveals normal physiologic responses. In spite of this, the physiology in

daily life is subject to functional upset that results in worry and distress on the part of the patient. It is not sufficient to establish the absence of local organic basis of the symptom. The important clinical question is, "Why does this vertigo recur?" The practical question of the patient is, "What can be done about it?" These questions, of course, are the same, depending only on the viewpoint. It is to this great class of "functional vertigo" that the present study is especially directed.

A classification of causes of vertigo will make clear the differentiation of those cases dependent on local pathology of the internal ear and its pathway, and those in which the functional alteration is dependent on outside and even remote disturbances. It must be kept in mind that the sensation of orientation is perceived through various organs:

- (a) The joints, muscles and viscera.
- (b) The eyes.
- (c) The static labyrinth.

The perfect functioning of these three sets of organs insures a sensation of equilibrium when at rest and a sensation of movement when in motion. The normal response to certain stimuli produces the expected sensation of vertigo. The abnormal response of pathologic organs or pathologically stimulated organs produces a sensation of vertigo where the relational facts do not justify. It is to the consideration of the pathologically stimulated organs, and particularly to the disturbance of the static labyrinth and its centers, that this study is devoted. While the classification of Jones<sup>1</sup> and Heitger<sup>2</sup> may be taken as a basis, the causes may be more conveniently listed as follows:

Group A

- 1. Disturbances in the joints, muscles and tendons.

Group B

- 2. Ocular vertigo.

Group C

Organic causes in

- 3. The static labyrinth.
- 4. The vestibular nerve.
- 5. Other intracranial structures.

**Group D**

Functional vertigo due to disturbance of the labyrinthine mechanism from the following causes:

- 6. Cardiovascular disorders.
- 7. Toxemia.
- 8. Refractory.
- 9. Neuroses.
- 10. Metabolic disturbances.

**GROUP A—THE JOINTS, MUSCLES AND VISCERA.**

Class 1.—Sclerosis of the posterior columns of the spinal cord.<sup>3</sup> Here is a disturbance of one of the organs of equilibrium by organic pathology—usually the progress is so slow that accommodation occurs concomitantly. The sensation of vertigo is perceived, however, when the patient shuts off one of the compensating mechanisms by closing his eyes or attempting to stand or walk in the dark. The tabetic has lessened equilibrium rather than active vertigo.

**GROUP B—THE EYES.**

Class 2.—Ocular vertigo falls into two groups:<sup>4</sup>

(a) Cases due to the act of vision with a sound eye.

(b) Cases due to the act of vision with an affected eye.

Cases of vertigo with sound eyes arise from seeing objects

(1) when resting, as example, the vertigo of altitude.

(2) when moving, as example, when looking out of car windows, seeing boats or merry go rounds. On such stimulation there is doubtless association of thoughts, which is proven by the memory of sensations felt under similar circumstances.

Under the latter head (b) come the cases of astigmatism, refractive disturbances, paralysis, or especially paresis, of extraocular muscles. High hypermetropia or insufficient convergence may result in headache and vertigo or vertigo without headache.<sup>5</sup>

**GROUP C—ORGANIC AFFECTIONS OF THE STATIC LABYRINTH AND ITS CONNECTIONS.**

Class 3.—Involvement of the ear mechanism by a lesion in the ear itself. Such cases vary from dramatic explosions of vestibular apoplexy<sup>6</sup> to the insidious atrophy or leucemic infiltration. They include vestibular labyrinthitis,<sup>7</sup> trauma,<sup>8</sup>

otitis media,<sup>8</sup> and unilateral closure of the eustachian tube.<sup>10</sup> During the course of an otorrhea or after postoperative cicatrization one may observe attacks of dizziness without labyrinth suppuration and often with very great disturbance of hearing. The cause is an irritation of the vestibular nerve endings.<sup>13</sup> These cases are dependent on local pathology, whose interfering presence can be proved by diagnostic tests.

Lund<sup>10</sup> reports two very interesting cases of otolith affection. There was either no function or markedly diminished function of the left semicircular canal system. At the same time, however, there was a hyperfunction of the otolith system which is seen from the considerable nystagmus to the right, with each position of the head which brought the left ear down. On the contrary, when the opposite positions were assumed, the slight spontaneous nystagmus ceased.

The relation of the rarefaction of air in the external auditory canal has been shown<sup>11</sup> therapeutically in treating a bad Meniere's case. The rarefaction in some way influences the circulation of the labyrinth beneficially.

Class 4.—Involvement of the ear mechanism by a lesion affecting the vestibular nerve. These cases are most commonly specific neuritis<sup>12</sup> or neurofibromata.

Class 5.—Intracranial lesions not involving directly the integrity of the vestibular nerve. The possible lesions are varied: hemorrhage,<sup>14</sup> trauma,<sup>15</sup> tumor, abscess, thrombosis, infarct, tubercle, gumma, multiple sclerosis, syringomyelia, meningitis and poliencephalitis. Injuries of the frontal lobe generally cause disturbances of reaction of the head inclination; injuries of the occipital lobe cause nystagmus symptoms; injuries of the parietal lobe cause disturbances of both reactions.<sup>16</sup> The cortical center of the vestibularis is said to be in the posterior district of the first and second temporal convolution.<sup>17</sup>

In groups A, B and C are found the cases of vertigo or dizziness due to organic affection of the organs of orientation. The cases of Group A are least in number, least in annoyance and least in clinical importance. Those in Group B come next, while those in Group C are most frequent, most intense and clinically common.

In the remaining Group D are those cases not dependent on pathologic changes in the organs of orientation. They arise from stimuli from other organs or from general conditions. The irritation, depression or imbalance of the equilibrium apparatus results in functional vertigo. Of these cases of functional vertigo there are an untold number. The complaints of the patients are heard frequently. The careful consideration of etiologic groups is important. In many of them the question as to whether the irritation or depression is active on the periphery (vestibular nerve endings) or central (ganglia or cortical centers) is not, by any possibility, to be answered.

#### GROUP D—FUNCTIONAL VERTIGO.

Class 6. Cardiovascular Disorders.—The presence of a cardiovascular disturbance alone is not sufficient evidence of its being the cause of coincident vertigo. The organic causes, already noted, should be carefully excluded.<sup>18</sup> The dizziness in cases of high blood pressure has been proven therapeutically by Ornstein.<sup>19</sup> By the use of papaverin the high blood pressure was diminished and with it the dizziness. Curschmann,<sup>20</sup> from the discussion of a large mass of material, concludes that the functional Meniere's complex may be traced back to vasoconstrictory influences. Vernet,<sup>21</sup> in cases where vertigo appeared to be due to vasolabyrinthine disturbance, has for several years tried adrenalin by mouth as a treatment. While final judgment is not justified, he claims that his results have been very promising.

Class 7. Toxemia.—Such irritation may arise from exogenous poisons as alcohol, lead, salicylates and quinine or endogenous poisons of acute type, as colds or acute fevers, or more persistent poisoning, as intestinal or focal or chronic infections.

After veronal intoxication and after the use of luminol for months, vertigo has been observed.<sup>22</sup> Scopolamin<sup>23</sup> vertigo is accompanied by increased labyrinthine irritability. It is similar to vertigo from alcohol intoxication.

In four cases of grip with normal hearing, the patient had vertigo for from one to seven weeks.<sup>24</sup> The cause is thought to be a toxic irritation of the vestibular nerve.

Vertigo may arise from dental infections. It has also been the author's experience to meet with a considerable number of cases of antrum empyemas and cases of frontal sinusitis with pronounced vertigo. The hearing in these cases, as a rule, is not affected—nor can any other pathology of the internal ear be found. The vertigo invariably disappears under proper treatment of the affected sinus. The tonsils may also be sources of irritating infection, but more rarely than the teeth. Kerrison<sup>26</sup> reports one case due to chronic constipation, one due to autointoxication from the tonsils and three to ptomain intoxication. In these last three cases there was a consecutive neuritis of the vestibularis.

Tarneaud<sup>25</sup> reports a case of hereditary syphilis in which angiospastic crises occurred in the left ear, accompanied by local anemia. Mygind,<sup>30</sup> discussing hereditary syphilis with deafness, tinnitus and vertigo, reports clearing of the tinnitus and vertigo under mixed treatment. Doubtless, some destructive pathology occurs in all of these hereditary syphilis cases, though the earlier the functional disturbance is recognized, the better the prognosis for saving the integrity of the internal ear. It is quite likely that irritative vertigo may precede destructive changes affecting the hearing by quite a space of time. This warning, if recognized, would enable the aurist to save the hearing by early therapeusis.

Class 8. Reflectory Vertigo.—The experimental possibility of reflectory vertigo was demonstrated by Urbantschitsch.<sup>27</sup> He showed a case where a touch on the stapes region or on the promontory brought on a flashlike movement in response. Since there was, in this case, complete deafness and also caloric nonirritability and no reaction to rotation, as well as no fistula symptoms, he considered the vertigo as clearly a reflectory one. A similar attack of dizziness could be provoked by him from the most exterior and posterior antrum area thus far from the labyrinth, and also by the slight brushing with a fine brush. This is proof that he did not have to deal with a mechanically produced vertigo.

There are cases where an unpleasant odor or a bad taste may be followed by dizziness.<sup>41</sup> There is a question whether this is reflectory from the nose and throat or whether it may not be psychic.

Curschmann,<sup>29</sup> in discussing the pathogenesis of gastric reflexory vertigo, states that it is a frequent accompanying symptom of painful gastric affections, especially hyperacidity and gastric or duodenal ulcers, whose primary vagotonia inclines to vertigo. The visceral vagus terminals are the stimulus receivers which transmit the same to the vagus nuclei. The usual response is systemic vertigo of varying intensity. Change of the vestibular tonus and vagotonia are, therefore, the disposing factors; the heterogenous (gastrogenous) irritation is the exciting momentum for the genesis of the gastric vertigo. In patients suffering from the affections of the vagus<sup>28</sup> (vagotonia), who were complaining of subjective noises and vertigo, the latter may become less or even cease by administering atropin. The noises are influenced by pilocarpin. There is a parallelism in the administration of such medicines in regard to the effects on the ear symptoms and on the nervous system as a whole.

Lemierre,<sup>30</sup> without denying Troussseau's phenomenon of gastric vertigo, assumes that gastric diseases, in a reflexory way, may lead to cardiac affections, which latter may themselves become the cause of dizziness. More particularly, the extrasystols increases the sensation of vertigo. He reports a case with frequent attacks of vertigo in connection with extrasystols which appeared in the course of disturbance of digestion.

Von Bergmann<sup>31</sup> points out that until recently little has been noted of vertigo with diseases of the gall bladder. This arises from irradiations from the visceral vagus nucleus into the vestibular nucleus, causing functional disturbances in the equilibrium organ. By analysis of these cases otologists may be able to show that the biliary vertigo concerns the right ear, while gastric dizziness concerns the left ear. He cites a case of vertigo which, by mistake, was referred to arteriosclerosis but which cleared up after extirpation of a gallstone bladder.

Class 9. Neuroses.—Curschmann<sup>29</sup> has studied functional vertigo in a large number of neurotics. The attacks may be traced back to vasoconstrictory influences. Erben,<sup>32</sup> in discussing the differential diagnosis of dizziness, gives due consideration to general diseases, poisonings, neurasthenia and

hysteria, considering the experiences observed during the war with injuries to the skull and with nervous shock.

Kobrak<sup>33</sup> holds that most cases of vertigo and tinnitus aurium by attacks constitute a clinical unity, representing a labyrinth angiopathy on a vegetative neurotic basis. This is a vegetative labyrinth angioneurosis, as also shown by observation on caloric irritability before and after injection of vegetatively efficient means, as pilocarpin, atropin, suprarenin.

Leidler and Löwy,<sup>34</sup> in a paper on "Dizziness with Neuralgias," point out that a great majority of such patients suffering from vertigo show a hyperirritability of the vegetative nervous system and a close relation with the aspect of migraine.

Thornval<sup>35</sup> demonstrated a case of neurasthenic vertigo with

1. No spontaneous nystagmus;
2. Spontaneous past pointing outwardly in both shoulder joints and in the left wrist;
3. Very violent subjective hearing sensations with the caloric and the rotary tests;
4. Atypic and even contrary pointing reaction with the caloric test.

Certain hysterical cases of deafness, with or without dizziness, became dizzy<sup>36</sup> as soon as both ears are stopped up by introducing the index fingers deep into the external auditory canals, or by pressing repeatedly on the tragus or by passing the faradic current through the head at the level of the tragus. These cases began to improve in hearing as soon as these procedures called forth dizziness. There was probably an angiospasm as the active factor in the deafness.

Lermoyez<sup>37</sup> discusses "A Vertigo That Brings Back the Hearing." There was tinnitus aurium and difficulty of hearing up to complete deafness. Suddenly there was violent vertigo and in a few hours hearing came back. The active cause was local angiospasm with neuroarthritic or gouty subjects. The spasm of the arteria auditiva interna produces the Meniere's symptom complex, that of the arteria vestibularis, vertigo without disturbed hearing, and that of the arteria cochlearis sudden and temporary deafness without vertigo.

Class 10. Disturbances of Metabolism or of the Endocrin Balance.—Vernet<sup>21</sup> recommends the trial of adrenalin by mouth as already noted for those cases of vertigo due to vasomotoric disturbances in which an endocrin basis may be suspected.

Sanes<sup>38</sup> discusses vertigo of the menopause. He urges the careful exclusion of cardiovascular disturbances and of the causes of ocular vertigo. There is a definite group of these cases in which the active cause is the deficiency in the internal secretion of the ovaries. He uses as therapy fresh or dried ovarian substance. In one case a combination with a small dose of thyroid extract seemed to be advantageous.

Much has been written and great emphasis laid on arteriosclerosis and high blood pressure. This underlying cause as active in producing vertigo has been referred to under Class 6. There is another great class of cases which are becoming either more numerous or are being more clearly segregated by observation. These are the cases of low blood pressure. While cases differ in detail, the broad picture is somewhat as follows:

The patient (rising 35 years of age) is, as a rule, of nervous temperament and with many strings to his bow of activity and interest. He is a driver in his work; he is, as a rule, under the socalled normal weight for age and height; his pulse rate is from 64 to 70, and his basal metabolism from —8 to —20; his blood pressure is (systolic) from 110 down to 90 or 95. One of the very common symptoms is vertigo. Whether this is due to passing waves of localized ischemia or to some endocrin influence is not entirely clear. Therapeutically, these cases must be attacked by rest, sodium cacodylate, feeding and by ductless gland substance. Under such a course, the blood pressure rises, the pulse quickens, the metabolism increases, appetite improves and weight is somewhat enhanced. When these conditions are obtained the vertigo disappears.

#### CONCLUSIONS.

1. Vertigo as an annoying symptom is quite frequent.
2. There are many more cases of functional vertigo (Group D) than in the other three groups (joint, muscle, ocular, and organic labyrinth-intracranial).
3. It is quite desirable to pay due consideration to the complaint of vertigo and first review the possibility of its cause in a given case lying within the groups A, B or C.

4. It is finally desirable to carefully consider in which class the cases of functional vertigo fall.

5. By such careful study of cases of vertigo, referred or coming direct, the otologist can establish himself as a thorough diagnostician and a valuable consultant.

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LXIX.

ACUTE ETHMOIDITIS WITH RUPTURE INTO  
THE ORBIT.

BY ARTHUR C. JONES, M. D.,  
BOISE, IDAHO.

The fulminating character of the acute ethmoiditis, which breaks through into the orbit, leads me to believe that there may be a chemical action produced by the bacterial growth which leads to the formation of carbon dioxid under great pressure, and that the etiology is not always a defect in the osseous boundaries.

Previous writers have pointed out that bony defects allow infection to extend from the ethmoids into the orbit. Schaeffer<sup>1</sup> says: "Dehiscences are common in the orbital plate." ("Os Platum, Lamina Papyracea, of the Ethmoid Bone.")

He has likewise observed a number of specimens in which the mucous membrane of the ethmoid cells was in actual contact with that of the dura.

"The importance of dehiscences in the spread of infection from the ethmoid labyrinth to the tissues of the orbit and the meninges must ever be kept in mind by the clinician."

I have had three of these rare cases of acute ethmoiditis with rupture into the orbit. Skillern<sup>2</sup> says "they are rare, at least in this country." Two of these I will report in detail later.

If my deductions are correct, there are certain pathologic findings in my cases that are significant. Others have reported similar pathologic findings, but have not attached the same importance as I to them.

1. The majority of cases of ethmoiditis with rupture into the orbit cited in the literature are in the young. Roberts and Harris<sup>3</sup> report a case in a student of 16, Ira Frank<sup>4</sup> a case in a youth of 19, Morgagni<sup>5</sup> a case in a girl of 16; Siegmeister<sup>6</sup> reports five cases, the oldest of which is 11, and Phelps<sup>7</sup> reports ten cases, the oldest of which is 12.

2. The anatomic position of the ethmoid labyrinth is such that it predisposes to the formation of a dead chamber.

The labyrinth is connected on the inside with the nasal cavity, of which it forms the external wall, on the outside with the orbit, below with the superior maxillary, in front with the orbital apophysis of the palatine, and behind with the body of the sphenoid. The ethmoid cells are anfractuous cavities in the body of the lateral mass of the ethmoid bone opening into the superior and middle meati. Moreover, not infrequently cellular extensions into the overhanging middle nasal concha extend the ethmoid labyrinth below the level of the uncinate process.

3. In acute ethmoiditis there is early complete nasal obstruction on the side involved. Skillern<sup>8</sup> states: "There is absolute occlusion of the nares, particularly the superior portion between the eyes. (The inferior turbinates are sympathetically involved.") Morgagni<sup>9</sup> in reporting a case emphasizes several of these important observations. He states: "One week before observation ocular pain and fever had set in, followed within 48 hours by protrusion and chemosis. At the same time the nasal discharge stopped completely. Nasal examination showed the left nasal mucosa edematous, with hypertrophy of the turbinates, especially the middle, and numerous small polypoid masses covered with dense strata of yellow green secretion. There was evidently an open ethmoid empyema of the anterior cells, which had found its usual nasal outlet obstructed and so had invaded the orbit."

4. The time between the beginning of the pain and the rupture into the orbit is short. Gibby<sup>10</sup> reports a patient who went to bed with mild coryza and awoke in the morning with a bulging eye. Several other writers report similar occurrences. None of my cases had had pain longer than 24 hours before the rupture into the orbit occurred.

5. The pus was under great pressure in one case, and in the other it was mixed with air bubbles. The case where the pus was under great pressure was operated on within ten hours after the rupture into the orbit. Very likely, if more time had elapsed, the anterior ethmoid cells would have broken through the lacrimal bone into the orbit, and I would not have found the pus under such high pressure. In the course of the operation I curetted into the anterior ethmoid cells through the

lacrimal bone. There was a sound of escaping gas, followed by a spray of pus. Roberts and Harris<sup>11</sup> say in one of their reports that "A small amount of pus and what appeared to be air bubbles escaped through the supraorbital opening."

In brief, we have the following syndrome:

A young adult or child has a stuffy nose, either following influenza or some of the acute exanthemata, with a slight supraorbital or neuralgic pain confined to the area about the eye. The pain grows rapidly worse. Sleep may be induced by opiates or local hot or cold applications. When the patient awakens a few hours later the eye is nearly closed and the ball is pushed downward and outward. On opening into the ethmoid area we find pus under pressure mixed with air bubbles.

Intracranial complications with resulting meningitis are reported. (Connell.<sup>12</sup>) Two of my cases developed meningeal symptoms and one ended fatally. There are several pathways for the infections to follow in spreading to the meninges. Skillern<sup>13</sup> says, "The course of the infection is backward along the tract of the optic nerve and that it will quickly penetrate the cranium, causing lethal intracranial complications." Muller<sup>14</sup> states that "There are lymphatics penetrating the posterior bony wall of the frontal sinus and these may carry pus from the sinuses to the dura over the frontal lobe of the brain under exceptional conditions of pressure in the sinuses." He also states that "The lining membrane of the nasal fossæ is continuous, and infection at one point can probably be conveyed by lymphatics to any other point." Wright and Smith<sup>15</sup> state that "The lymphatic drainage of the accessory sinuses is in continuity with the subarachnoid and subdural spaces." Shaeffer<sup>16</sup> has already been quoted in regard to the dehiscences. He also states, "The cranial cavity may be involved, the ethmoid infection extending by way of the ethmoid veins. The very intimately related ophthalmic vein may carry infection into the dural cavernous sinus; occasionally, especially in children, the small vein which traverses the foramen cecum infects the superior sagittal or longitudinal dural sinus."

It is my opinion, however, that pus forming under tremendous pressure may or may not follow the course of dehis-

cences, but may break through the paper thin bone of the cribiform plate, or burrow backward along the course of the optic nerve, or follow the course of the lymphatics. We find the condition more often in children than in adults, because in them the bony walls are thinner, and there is an absence of dense fibrous tissue that develops in adults from long continued nasal infection.

Case No. 1.—A boy, age 16, came into my office one evening from a town 70 miles distant. His right eye was nearly closed and he was in great distress because of pain above and around his right eye. He stated that he had had a disagreeable cold for the past four days. During the previous day he had had some pain over the right eye, and at night he had taken an aspirin tablet to relieve the pain. On awaking his right eye was nearly closed and the pain was intense. Examination of the nose showed the turbinates markedly swollen and a small streak of pus was working its way down over the anterior end of the middle turbinate. The mucous membrane was shrunken with cocaine and adrenalin and suction was applied. Immediately the suction tube was filled with a third of an ounce of thick yellow pus. The boy was sent to the hospital and X-rays taken. The X-ray technician reported that both frontals were very much clouded and the ethmoids on the right side were involved. The white blood count was 18,000, the temperature was 102. The following morning I made a Killian incision through the brow and curved it down the nose. An attempt was made to open the right frontal sinus. In this I was unsuccessful. Additional study of the X-ray showed no frontal sinus present. The skin incision was extended further over the nose, and the periosteum over the lacrimal bone was cut through. This was followed by a rush of pus mixed with an occasional air bubble. Examination showed the papyraceous lamina of the ethmoid bone denuded of periosteum and eroded. Extranasal exenteration of the ethmoid cells was performed as far as possible. A rubber tube for through and through drainage was inserted and stitched to the skin and frequent irrigations were given.

The wound discharged freely and considerable pus came through the nasal tube. The patient seemed to do fairly well

for three days and then developed a chill, with a rapid rise in temperature to 104. After that he had some chilling nearly every day, with remissions of fever ranging from 99 to 107. On the sixth day he had a severe chill and a temperature of 105.2, with a pulse of 112. The fundi had been examined every day, but only a venous dilatation was seen. On the seventh day after the operation the temperature went to 107.2, and the patient developed a marked papilledema in both eyes. There was a positive Kernig. The blood culture was negative. It was suggested that a subtemporal exploratory trephine be made, but the mother refused to have this done. On the eighth day he had some sluggishness of speech. On the tenth day the left side of the face became partially paralyzed and the left hand numb. The swelling of the nervehead had increased and there was 3 D. in right and 2 D. in left. The eleventh day there was severe twitching over the entire left side. It lasted about fifteen minutes and the pulse dropped to 63. Superficial skin abscesses formed about the temple and over the scalp. These gave the same culture as the original infection—that is, *staphylococcus aureus*. On the twelfth day the entire body twitched and the boy was unable to speak. The lower jaw twitched continually. The temperature was 106.6, the pulse 82. The fifteenth day the patient had severe facial twitching and coughed for a half hour after eating. The highest temperature was 104 and the pulse 46. The pulse was becoming much slower and was very irregular. The mother still refused to permit an operation. The white blood count was 14,600, the blood culture negative. On the seventeenth day the pulse dropped to 50, patient voided involuntarily. The highest temperature was 104 and the lowest 99. On the eighteenth day the right pupil dilated in the morning and there was 3 D. of swelling; Cheyne-Stokes respiration appeared; the pulse was 48. In the afternoon both pupils dilated. He died the following day. The diagnosis made was purulent meningitis following ethmoid infection.

Case No. 2.—A boy, age 16, had been swimming and diving in a contaminated river frequently for the past month. He had noticed that the breathing was stuffy. The night before he became acutely ill he had more stuffiness than usual, and a severe pain developed over the left eye. During the night,

the mother said, he was somewhat delirious and suffered intensely from supraorbital pain. In the morning the left eye was shoved forward, outward and downward. The boy was brought to my office about 11 o'clock in the morning. Examination showed the left eye was nearly closed, with ecchymosis of the upper eyelid and slight midriasis of the pupil, with some papilledema. The lad was in great pain. Examination of the nose showed left nostril completely blocked by bulging turbinate, but no free pus was seen. The temperature was 101, the white blood count 17,600. X-ray showed slight clouding of the ethmoid cells. The frontals were clear, but the entire left side of the nasal passage was filled with swollen turbinates. It was decided to operate immediately. A Killian incision was made along the brow and curved well down over the side of the nose and below eye. The tissues bled freely, but no pus was found until the periosteum was incised; then a large amount escaped under pressure. No break could be found in the orbital plate of the ethmoid. With a small, stout curette the lacrimal bone was broken through over the anterior ethmoid cells. Immediately there was a noise of escaping gas. The pent up pus was under such pressure that small globules were sprayed on the towel around the forehead. Cultures of this pus showed pure staphylococcus aureus. A through and through drainage was made from the supraorbital opening into the nose. The wound was irrigated with 1/5,000 acriflavin every two hours.

The course was uneventful for three days, then the pulse became irregular and weak, and a persistent headache prevented sleep without opiates. Abscesses developed on the back of his right hand and below the left shoulder blade. The culture from the pus was pure staphylococcus pyogenous aureus. The fifth day the pulse dropped to 48, with a slight rise in temperature; white blood corpuscles, 26,000. The blood culture was negative. The left disc showed 3 D. of swelling, in right 1 D. The eye was pushed out so far that the lid did not cover the cornea, and vaselin dressings were kept over the cornea constantly. The following day the pulse went up to 95, the temperature to 101. That night the pulse dropped to 40 and was very weak and irregular. The patient complained of stiffness of the neck and there was positive Kernig. After consultation

it was decided to do a subtemporal decompression. A small button of bone was removed with trephine and that was enlarged with rongeur biting forceps. No pus was found extradural. An incision was made through the dura, where it was adherent to the bone. Cerebrospinal fluid escaped under pressure. It was clear at first and later flocculent. In a few minutes the pulse increased in rate and became more regular. Later microscopic examination of the fluid showed much mucoid material with a few disintegrated pus cells. The culture showed no growth. Exploratory puncture did not reveal any walled off abscess. A drain was inserted and the skin wound sutured. The original incision above the eye was opened wider and irrigations with 1/5,000 acriflavin were continued every two hours night and day. The pulse and the general condition improved rapidly. The white blood count was 13,400. There was a swelling of the disc of 1 D. in the left eye but none in the right. Large quantities of pus continued to discharge from the nose, even after all external wounds had closed. Patient was able to leave the hospital in two weeks' time.

Case No. 3.—Musician, age 19, gave a history of acute cold with complete blocking of the nostril previously to the swelling in the eye. He came to me because of pain and swelling above and behind the left eye. The patient was not acutely ill but was suffering intensely. The interior of the nose was swollen, the temperature was 99.8, the white blood count 13,000. An external incision liberated about a dram of pus. Intranasal ethmoid exenteration was performed and the patient was well in ten days.

In these three cases and in the cases reported by other men there are a few points that I consider of extreme importance as a positive factor in producing the dangerous condition of ethmoiditis with rupture into the orbit:

1. The youth of the patient and probable lack of firm bony development.
2. The swelling of the middle turbinate and the sympathetic turgescence of the inferior turbinate, closing the normal outlet and making an air tight cavity, thus causing the bacteria to grow under anaerobic conditions. In searching for a possible explanation of why the pus should be under such a tremendous pressure I called upon my friend and former professor

of bacteriology, Frederick G. Novy, of the University of Michigan. Quoting from his personal letter:

"I presume your question as to whether staphylococcus causes fermentation is based upon the fact that you give, that the pus was under tremendous pressure. This I would say is due to the fact that your organism is growing and producing carbonic acid, which, unable to diffuse or pass out into the surrounding tissue, is confined, and hence gives rise to positive pressure. The more anærobic the condition under which it is growing, the more likely would the pressure be positive. If it were growing under aerobic conditions, the pressure would be negative."

Here, I believe, is a very probable explanation of why we have the bulging eye and the meningeal complications in this type of ethmoiditis. The infecting organism is in the ethmoid cells. The middle turbinate closes off the middle and superior meati, and this is further reinforced by the swelling of the inferior turbinate. Referring to the previous anatomic description of the ethmoid labyrinth, one can easily see how there is an air tight chamber formed and why it is easier for the pus to perforate the orbital plate into the orbit or through the cribriform plate into the cranium than to follow its natural channel into the meati. The bacteria multiply rapidly, the cultures are seldom mixed, and carbon dioxid is manufactured in large quantities during the growth of the staphylococcus.

#### CONCLUSIONS.

1. The theory that there is formation of carbon dioxid under pressure is probably correct; it accounts for the bulging eye and the meningeal complication in this type of ethmoiditis.
2. Acute ethmoiditis with rupture into the orbit occurs more often in childhood and young adults, because there is less fibrous connective tissue in the turbinate, and this permits a more rapid and greater swelling of the turbinate and also makes it easier for the pus to break through into the orbit or into the cranium.
3. There has been no immunity developed to the invading organism and this causes a greater local reaction.
4. It is dangerous to temporize with any case of orbital swelling with ethmoid infection. Prompt surgical relief should

be given. Where meningeal complications have intervened it is advisable to do a subtemporal decompression and make stab punctures in the brain substance in the hope of striking the localized abscess.

One or two cases cannot establish a proof, but it is worth while to bring out the foregoing.

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LXX.

REPORT OF FOUR CASES OF MASTOIDITIS WHERE  
OPERATION WAS TOO LONG DELAYED.

By C. J. SWAN, M. D.,

CHICAGO.

It should be unnecessary to lay any emphasis on the fact that surgical interference in mastoiditis may be delayed too long.

My excuse for calling attention to this well worn topic is the fact that at the present time one hears much of the sin of too early operation and very little of the dangers of too late operation. It is even possible, at the present time, that an operator would be more severely criticised by his colleagues for a too early and possibly unnecessary operation than for waiting too long for more definite symptoms and being surprised by complications having perhaps a fatal termination.

I am reporting four cases observed in my own practice where interference was too late. Two of these cases when first seen had, to be sure, already passed beyond the arbitrary period of waiting outlined by some authorities, but in neither had the outstanding symptoms indicating the necessity for operation appeared. These cases possibly would not have been operated on in any case, had the arbitrary rules laid down by the advocates of the waiting method been accurately followed.

Case 1.—E. L., a rather tall, spare man, 58 years of age. First seen at his home April 12, 1921, at noon. Patient was lying on his bed, fully dressed, having just returned from his office. The history told of pain in ear and left side of head for the past three weeks, but not of sufficient severity to incapacitate him for work. He had had a mastoid operation on the right side 14 years ago. Hearing, normal on right side and much impaired on the left. Inspection revealed a normal canal and a red but not bulging membrana tympani. Mastoid region unchanged. No edema or swelling or injec-

tion; slight tenderness to deep pressure. Temperature, 103.6 F. Patient complained of severe pain all over left side of head. The patient seemed bright with unclouded consciousness. A tympanotomy was performed without releasing more than one drop of fluid. After taking the temperature the examination was not continued, but an ambulance was ordered and the patient was sent to the hospital.

When seen, three hours later, he was comatose, with unequal pupils, slight nystagmus and plus Babinski, stiff neck and a moderate discharge from the left ear. Spinal puncture by Dr. Bassoe gave a turbid fluid not under pressure. A mastoid operation was performed at once. The mastoid findings were unusual. There was no thickening of the skin, and subcutaneous tissue and the pericranium peeled off easily. The mastoid cortex was of a livid hue, otherwise unchanged. The cells of the pneumatized portion were of a bluish lead color, devoid of mucosa and contained a few granulations, a little pus in the antrum and the cells were turned out easily with a curette; a sort of dry necrotic process, never before or since observed by the writer. Type three pneumococcus was recovered from the mastoid and also from the spinal fluid. (Report by Dr. Dick, pathologist.)

The patient died two days later of leptomeningitis. No autopsy was obtained.

Comment 1.—So far as could be learned, this patient had had but two symptoms during the three weeks of ear involvement before the writer made his first call. These were pain of a variable severity, but growing worse as the disease progressed, and impaired hearing. Whether he had temperature during the course of his trouble no one knows. He went to his office and attended to his law business up to and including the day he was hospitalized, two days before his death. There was no change, no edema, no swelling over the mastoid, no discharge, yet the findings in the mastoid and in the spinal fluid prove conclusively that he died of otitic leptomeningitis, and his life could in all probability have been saved by an early operation.

Case 2.—Mr. T. H., seen in consultation at the Evanston Hospital, April 26, 1921. Patient was a man, 49 years of

age. Brought to the hospital in a comatose condition. The history was obtained from the family. Eleven days before, he had had a beginning paralysis of the left side. The fourth and fifth day he was better, but the tenth day he could not swallow food and could not answer questions. Six weeks before he had abscess of the right ear, which had ruptured spontaneously and which has been discharging, off and on, ever since. Whether the patient complained of pain or not could not be ascertained with certainty.

The patient was unconscious when seen by the writer. Examination showed a poorly nourished man of medium height, with eyes closed. Pupils unequal and react sluggishly to light. Discs were hazy at margins. There were present nystagmus, stiff neck, positive Babinski, flaccid paralysis left arm and leg. Ears: no change in the canal, no change in mastoid region. Membrana tympani, rather large perforation centrally located; slight discharge of thin pus. Ten cc. spinal fluid was withdrawn under normal pressure. The fluid was turbid but not bloody. The cell count was 9,000 to the cu. mm., in which Dr. Dick found streptococcus capsulatus mucosus. Autopsy two days later; diagnosis by Dr. G. F. Dick. Otitis media (right) suppurativa, osteitis of right temporal bone, abscess right temporal lobe of brain, basal meningitis. Bacteriology: Type 3 pneumococcus recovered from the mastoid, the spinal fluid and the abscess. An operation was refused in this case and was not strongly urged, as it was obviously too late to hope for much from operation. In this case the temperature never went above 102, respirations were 20 on entrance and increased to 38 at death. Pulse, 70 on entrance, increasing to 100 at the end. A pulse, respiration and temperature all, one might say, midway between what one might expect to find in a leptomeningitis and an uncomplicated brain abscess.

These two cases were hospitalized within two weeks of each other.

Comment 2.—Here there were more symptoms. This patient had a discharging ear, but no change in the mastoid or canal, and so far as could be learned he had not paid much attention to the ear. But here again was the insidious, the bone destroying, the complication inducing, the deadly Type 3

pneumococcus. There can be little doubt that an early operation would have saved this life.

Case 3.—E. S., well nourished, strong boy, eight years of age. Seen first November 26, 1923, four days after onset of tonsillitis, followed two days later by an acute otitis. Examination showed acute tonsillitis with a few spots of exudate. Culture negative for Klebs-Loeffler. Examination of ears: Left ear normal, right membrana tympani red and bulging. A tympanotomy released a large amount of serum. Culture showed hemolytic streptococci.

Two days later the father telephoned that the boy was very restless at night, complained of pain and dizziness. A visit was made and examination gave the following symptoms: Temperature, 103. The boy repeated the complaint of dizziness the previous day, but on examination there was no nystagmus or other evidence of dizziness. The ear was discharging freely. The canal was sagging and the mastoid quite tender, but there was no edema over the mastoid. The boy was ordered to the hospital. He did not go to the hospital, and later in the day I was discharged from the case. On the seventh day following, the parents changed their minds, as the patient was having high fever and much pain. He was sent to the hospital and I was reinstated. He was then running a daily temperature as high as 104 to 105; pulse 100 to 140; respirations 20 to 25. The ear had continued to discharge freely all the time. There was a slight tenderness of the mastoid at this time I am convinced, although others examining the mastoid took the contrary view. No swelling or edema. After other pathology had been excluded, the mastoid was opened. The bony cortex, except for a slight discoloration, was hard, healthy and normal. The pneumatized portion was entirely decalcified, and the whole cavity was full of pus and was emptied with a large curette, exposing the sinus and the dura of the middle fossa. Pus from the mastoid showed hemolytic streptococci.

The improvement in the patient's condition following this procedure was so slight as to be scarcely noticeable, and the case continued its septic course with daily high temperature. A blood culture showed many colonies of hemolytic streptococci. An operation for osteomyelitis of the left femur

giving no improvement, a phlebitis of the lateral sinus was diagnosed. A gray, unhealthy sinus was exposed and opened with ligation of the jugular vein. No clot was found in the sinus. It was noteworthy that at no time did the patient seem toxic. Nearly all the time, up to the advent of the terminal complication, he was bright and responsive if not especially cooperative. The case continued its septic course, and one complication followed another. He had three blood transfusions, but died of leptomeningitis after exactly four weeks in the hospital.

**Comment.**—This case, so far as could be learned, had been developing for six days when operation was first advised. Nine days later consent was obtained. It is fair to infer that had the case been operated on when first suggested the boy might and probably would have lived.

**Case 4.**—T. G., first seen November 15, 1923, a boy 3 years of age, below par physically, fretful and appearing quite ill. **History:** Three weeks of pain in ear; spontaneous rupture after one week; closed at the end of another week, when a tympanotomy was performed, from which a thick, sluggish discharge exuded when first seen by the writer. In this case when first seen, in the third week, all the classical symptoms were present: discharging ear, sagging canal, large swelling over mastoid, probable subperiosteal abscess. Temperature, 103. The child was very toxic and physically run down. The child was sent to the hospital and operated on the next day.

Mastoid operation right side. The bone was found to be thoroughly decalcified, and the curette cleaned out the bone cavity, which was full of pus. Hemolytic streptococci were found on culture.

The patient did well for a few days and then developed otitis in the left ear, which discharged for a few days. Then more high temperature (105) for two days, when it was decided that this temperature, in absence of other findings, was due to sinus phlebitis, in spite of the fact that we could not get a satisfactory blood culture, both that were taken being contaminated, and a third our pathologist could not obtain. The sinus exposed at the operation showed a pale and thickened wall. A ligation of the jugular was done; no clot

was found in the sinus. Later the patient was found to be slipping, and a blood transfusion was done, which had immediately a marked beneficial effect.

The patient subsequently developed a pneumonia, but left the hospital after six weeks, well, except for the mastoid wound, which did not heal until several weeks later.

Comment.—This child had been obviously neglected, so far as operation was concerned, but it had been hoped by those medical men in charge that it would clear up, as indeed it might possibly have done, up to, say, a week before operation was at last performed.

I believe that this child should have had an operation one or two weeks after the onset of the otitis, which would thus have avoided the long and perilous convalescence which it went through, finally escaping alive by a hair's breadth.

The beneficial effect of blood transfusion should be noted and emphasized in cases where the infection is gradually overcoming the resistance of the patient, and it is realized that he is slowly but surely slipping away. The writer has seen many instances where the tide has been turned almost instantly by blood transfusion. The blood transfusions were made in both these last two cases after the method of Dr. Lespinasse, using nonnitrated blood.

General Comment.—The two cases of *streptococcus capsulatus mucosus* presented to the writer several interesting features. Since 1913 he had been looking for this particular strain in his mastoid cases, but not until Dr. Dick became interested in the search was a case found. Then came another case within two weeks. Unfortunately the knowledge of the kind of infection came too late in the course of the disease to be of any benefit to the patients. This insidious strain of streptococci, or, as it has later been classified by bacteriologists of the Rockefeller Institute, Type 3 pneumococcus, is now so well known to the otologist that it is unnecessary to make much comment upon it. The pathologist Gohn first observed its peculiarities, and Neuman and Ruttin, all of Vienna, brought it to the attention of otologists in 1909.

The writer believes that at the present time there is possibly too much stress laid upon the necessity for waiting until one is sure that it is necessary to operate; that one must

wait a specified time, some say ten days, others two weeks, others three weeks, or, as one authority has written and was heard to say, "ten days in the absence of signs of complications." Of course, everyone knows that often when signs of complications occur it is then too late to save the patient.

It has been the observation of the writer that not only do cases differ in the virulence of the infection, but the infection differs in virulence in different years. In one year the run of mastoid infections is mild and one may wait in most cases as long as necessary. In other years the run of infections is very virulent, and complications are frequent, severe and early. In such a season one must in some cases operate very early—that is, well within the ten days prescribed by some of the least radical of those who believe in waiting a specified time. After all is said, each case presents its own problems and no arbitrary rule may be laid down which applies to all cases.

The writer would much prefer to operate only after three weeks, when one can be reasonably certain that decalcification has taken place; that the infected area is delimited and that the patient has perhaps established an immunity to the infection. One can then feel reasonably sure of a quick healing, whereas in an early operation, before decalcification has taken place, one has always to fear delayed healing.

On the other hand, I have seen decalcification take place in less than ten days, and I have yet to see the spread of the infection due to lack of immunity in the early operation. In other words, an experienced and careful operator may open the mastoid very early with, so far as I have observed, relative impunity except as to the delayed healing.

The writer would like to ask those who advocate a certain specified time before interfering or until it is perfectly obvious to anyone that an operation must be done, how many deaths they could reasonably attribute to too early or even obviously unnecessary operations performed by themselves or by other competent surgeons?

I believe the answer would be, not one—and this in spite of considerable talk about waiting for immunity and danger of the spread of infection.

Then I would like to ask them how many patients they have seen in their own practice and in the practice of other surgeons who have died because there was no operative interference or because operation was too late. Dr. George Dick, who was pathologist at Camp Pike during the war, made upwards of fifty postmortems on men dead from complications of mastoiditis who, in his opinion, came to postmortem because obviously they had been operated on too late. He has seen a number of similar cases in his own practice. He has never seen a case dead as a result of a too early or possibly unnecessary operation.

#### CONCLUSIONS.

1. It is dangerous to make any rule as to the time one should wait before operating, or as to the number, kind or severity of symptoms which should be present before operation should be performed.
2. It is equally as dangerous to attempt to make any hard and fast rule at all as to when to operate.
3. A careful and experienced surgeon will judge each case on its merits, taking into consideration everything pertaining to the case, and if still in doubt he had better operate.
4. Because the problem presented is very similar to that presented in appendicitis. If he operates too early or unnecessarily it is a thousand times better than if he makes the contrary error.
5. Unless we are to see many more deaths from mastoid complications in the near future, the pendulum must swing not too far the other way, but to a more well balanced position.
6. The teaching that goes out at present from the influential groups who believe in too much waiting is pernicious and dangerous, and gives standing to many medical pacifists who are not entitled to such standing.

Let us be rational and reasonable in handling this very dangerous and treacherous disease.

As a personal confession, I might add that I have undoubtedly operated on some cases too early and maybe unnecessarily, but they all recovered and are none the worse for it, and I have also operated on some cases too late, and they all died or came uncomfortably close to death.

When the surgeon is endeavoring to make up his mind whether to operate on a case of mastoiditis, it is necessary for him to think and to remember that the patient may recover without operation, but it is also doubly important for him to have distinctly in mind the fact that he is dealing with a dangerous and treacherous disease, and if he does not operate the patient may die.

It is the writer's firm belief that when a surgeon has in charge a case of mastoiditis from the onset, and the patient finally dies from a complication, it is almost without exception due to too long delayed interference. It is the surgeon's fault, and upon him should rest the blame and the responsibility.

LXXI.

SCHAEFER-GALTON WHISTLE.

BY ROBERT SONNENSCHEIN, M. D.,

CHICAGO.

Whatever its actual value to the profession may be, it seems to me whenever a new instrument or modification of some appliance pertaining to our specialty appears, it is no more than proper that the same be called to the attention of our colleagues as soon as possible. When in Berlin last September, I spent a little time with my good and distinguished friend, Prof. Karl M. Schaefer, who has, as you know, done so much work in the physiology of the ear and in connection with various apparatus used in acoustics, and in otology. It was his resonators with which I did work that I have reported to you before, and it was he who modified the Struycken monochord some time ago. He quite recently modified the Edelmann-Galton whistle, and was in the process of calibrating a number of them while I was in his laboratory a few months ago.

Before speaking of the apparatus, let me very briefly call your attention to some of the previous models of whistles used in otology. The original Galton whistle was first introduced into practice by Burkhardt-Merien in 1878. It was, as you all well know, a very simple appliance, consisting of a tube and a whistle, the pipe length being graduated. There is a bulb for forcing air through the whistle. The original Galton, however, had the disadvantage of producing many shrill overtones. So far as I am aware, no definite chart showing the pitches at the various readings on the pipe scale was ever determined or furnished with any of the whistles. It was, therefore, impossible to state accurately what pitch was being produced when the pipe length was set at any definite point.

Edelmann later changed this model to the form that most of us have used. In the Edelmann-Galton whistle the air is blown from a circular slit in the mouthpiece (Mundstück)

against the cylindrical pipe (Pfeifenkörper) with its movable core (Stempel). It is essential that the end of the aperture of the two parts be kept perfectly clean and that the form of the slit is not distorted in any way; otherwise the character of the air column will be changed, and likewise the pitch.

The calibration of the whistle is determined largely by the use of the Kundt dust figures or curves, of which two abscissæ constitute half of a wave length.

The new modification of the Galton whistle by Schaefer has a fixed mouthpiece. The apparatus is so constructed that one is able with two or three fingers to hold the apparatus, and with the two other fingers of the same hand to manipulate the pipe length. In order to get a constant, forceful air pressure a double bulb is used. This was also recommended recently for the Edelmann-Galton whistle in that a better air current is obtained. The short compressions of a single bulb often produce vibrations only of the edge of the pipe length. With the steady, forceful pressure of a double bulb we get the resonance of the tones of the pipe itself.

The graduations on the pipe length are in half millimeters. The technic is to set the pipe at a point supposedly above the high tone limit of the patient. Bring the whistle close to the ear, with the aperture near the meatus; then apply pressure and lengthen the pipe until the sound is heard. Then reverse the process by beginning with the tones easily heard, and shorten the pipe until the tone is no longer heard. The midpoint between the two readings usually shows the upper tone limit. As with the Edelmann-Galton, a chart is furnished showing the pitches at the various pipe lengths.

The advantages of the Schaefer-Galton whistle are, first, that the aperture is fixed at a constant point and needs no adjusting; second, it requires only one hand to manipulate the apparatus; third, this apparatus is somewhat cheaper than the Edelmann-Galton whistle.

All whistles have certain drawbacks. (1) There is difficulty in distinguishing between the blowing sound and that of the actual whistle. (2) Whistles will only test by way of air conduction. (3) It is difficult to keep the whistles in perfect condition so that the reading really corresponds to the chart.

(4) Unless a double bulb be used, one does not get steady, uniform pressure. (5) In the Edelmann-Galton whistle, if the aperture is at zero and the pipe length at 0.2, for the highest tone one cannot get sufficient air pressure to produce an audible sound at that point.

To test high tones, both by air and bone conduction, one really needs the monochord. The Schaefer-Stryken model is probably the best one for this purpose. The monochord is more dependable than the whistles and less easily disarranged. However, the Schaefer-Galton whistle is much more easily manipulated, less expensive and quite practical except where the highest tones are also to be tested by bone conduction. It has always been difficult to explain why it is that the very highest tones are usually heard better by bone conduction than by air. We ordinarily are accustomed to feeling that it is by air conduction that we can better appreciate high tones than by bone. Kalähne says that with the monochord the high tones are better heard by bone because the amplitude employed is the same for air and bone conduction. With tuning forks this is not possible, because the stem vibration practically always has an amplitude of only about one one-hundredth of that of the prongs. He further believes that, with the lowering of the upper tone limit, the bone conduction is relatively more diminished than the air conduction.

The monochord has many advantages in testing the upper tone limit. The whistles, however, when in good condition and properly used, are valuable members of our instrumentarium, and give a rapid estimate of the upper tone limit by air conduction. The Schaefer modification seems to us the most practical model.

## LXXII.

### DYESTUFF ANTISEPTICS IN RHINOLOGY.\*

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Numerous attempts have been made to utilize the penetrating power of organic dyestuffs for enhancing the action of antiseptics. It is, of course, probable that such penetration is rarely deeper *in vivo* than the second or third intercellular spaces from the epithelial surface. Two distinct ways of using the complex coal tar derivatives have grown up. One type possesses intrinsic antiseptic powers, and this includes most of the true dyestuffs; the other includes dyestuffs or combinations or their substances of origin, to which accepted antiseptics have been added and integrated. Mercury and the phenol derivatives are the common additions to this second class.

The conclusions reached in this study are clinical and are based upon published bacteriologic studies already of record.

Aqueous solutions have been used in the nose, which have limited the concentrations employed to 1:100 up to 1:10,000. In otology, of course, as in limited nasal ulcerations, very strong solutions are possible by the aid of 50 per cent alcohol, with or without glycerin.

True dyestuffs include the rosanilin group (triphenylmethane), which forms various colors with addition or subtraction of certain radicles, or owing to mixture of two or more substances. Their action is not caustic, but is undoubtedly due to the phenyl radicles. Crystal violet is the purest, then gentian violet (pyoktanin), methyl violet, and fuchsin. Other dyes occasionally employed, from neighboring chemical groups, are malachite green and methylene blue.

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In general, these substances work best in 1:1,000 to 1:30,000 aqueous solution, especially against the staphylococci, *bacillus pyocyanus*, *bacillus diphtheriae* and *bacillus coli*. They are valuable in meatal furunculosis. Against diphtheria carriers the violets are highly esteemed; but they do not so completely sterilize the nose and throat as to obviate the necessity of tonsillectomy and adenoidectomy in certain cases. The deep colored skin stains left by these agents are most objectionable to sensitive patients, and they are also ruinous to linen and clothing. These objections interfere with any save the topical use of the rosanilin group by the clinician himself. They cannot be dispensed for general use, and their bactericidal power, while high, is much below that of the organic mercury or phenol compounds.

Intravenous injection of gentian violet (5 mgm. per kg. of body weight, in dilution of 1:200) has been advised in treatment of staphylococcic septicemia, and a few brilliant cures have been reported. Severe temperature reaction occurs and a peculiar cyanosis persists for many hours.

Dimazon (diacetyl amidoazotoluene) and scarlet-R (toluyl-azotoluylazo-betanaphthol) have been useful in stimulating epithelization of denuded areas where good circulation exists. Septal or postpharyngeal ulcerations and radical mastoid cavities may be healed smoothly by the sparing use of a 1:100 ointment or solution. Deep staining does not occur, and there is no very marked antiseptic action; rather a stimulation of cell growth and resistance.

Acriflavin (derived from acridin and used as trypaflavin by Ehrlich in 1912) is too rapidly decomposed with release of hydrochloric acid to be useful in rhinology or otology. Neutral acriflavin (the basic 3:6 diamino-10-methyl-acridinium chlorid) is, however, fairly free from this objection, and may be used 1:500 in 50 per cent alcohol in the ear, or 1:1,000 to 1:2,000 in the nose and throat. Solutions must be mixed fresh every few days, as they are inert after a week. Acriflavin is most useful for irrigations; its yellowish stain is not very troublesome, but the taste is repugnant to some.

High approval has been gained among the mercury organic combinations by mercurochrome 220 (the disodium salt of

2:7 - dibromo -4- hydroxymercurifluorescein). This antiseptic contains about 24 per cent mercury, and penetrates rather deeply, owing to its content of fluorescein. Protein coagulation, so undesirable in bichlorid antisepsis, is not observed in any of the usual concentrations of mercurochrome. In the ear it is used up to 1:20; in the nose, 1:100 solution may be dropped in, but for irrigations or antrum lavage 1:200 to 1:500 are preferable. Approximately 1 per cent of our cases report a distinct burning in the nasopharynx after instillation of fresh 1:100 mercurochrome, and a few cases have been rendered excessively uncomfortable by the injection of 1:200 into the antrum following lavage. Incompatibility of mercurochrome with butyn and cocaine, as with numerous other local anesthetics and alkaloids, may be responsible for some of this irritant action; but it is definite for certain patients and may be elicited repeatedly. No previous stigma for determining such susceptibility has been discovered by us.

Mercurochrome solutions lose bactericidal power somewhat within three or four weeks, but a decided increase in irritant qualities occurs within five or six days, so that we prepare, dispense and prescribe only limited quantities daily. Convenient dispensing tablets are available for this purpose.

Mercurochrome is especially valuable in attacking the various streptococci. We have never observed loss of epithelium from its use, although its stain is persistent where epithelium is already gone.

Solutions of scale mercurochrome, 5 mgm. per kg. of body weight, in fresh, nonboiled 1:100 solution, have been frequently employed of late in cases of streptococcal septicemia. They are absolutely useless in streptococcus viridans infections, but have given excellent results in several cases of hemolytic streptococcal septicemia. As with gentian violet, severe temperature reaction takes place, and the kidneys must be watched carefully. Our own experience is not very favorable; one case of colon bacillemia was not helped by several blood stream injections, but yielded promptly to syringing an infected antrum with 1:100 solution. Two hemolytic streptococcal septicemias were fatal, one tonsillar, the other ethmoidal in origin.

Meroxyl has been offered as a nonirritant substitute for mercurochrome, and lacks not only the bright scarlet stain but

also the valuable quality of penetration. It is more stable but also more toxic and must, therefore, not be instilled in strengths beyond 1:500 to 1:1,000.

Mercurophen (sodium - oxymercury-ortho-nitro-phenolate) contains about 50 per cent mercury and must, therefore, be diluted to 1:400 to 1:10,000 for rhinologic and otologic use. Its coagulant action on cell protein is far less than that of the chlorid, but it has an acrid metallic taste, and is therefore avoided in rhinologic practice. Solutions require preparation from crystals or tablets in hot distilled water, and remain stable if corked; if open, precipitation from carbon dioxid occurs.

Metaphen (4-nitro-3-5-bisacetoxymercuri-2-cresol) is a more recent discovery, containing about 60 per cent mercury. Insoluble in water, it is obtainable as a 1:500 solution in dilute sodium hydroxid, from which dilutions of 1:5,000 to 1:10,000 are readily prepared for nasal and aural use. There is no coagulant action on protein in any practicable strength. Bactericidal power in vitro has been computed as eleven times that of bichlorid of mercury in equal concentration. An added point in favor of mercurophen is its decided and immediate shrinking of engorged mucosal structures, most useful in the treatment of acute inflammatory conditions. Secondary and increased swelling, such as occurs after adrenalin or epinin, is not seen after metaphen. So far we have had no complaint of irritation or burning, nor is there an appreciable metallic or acrid taste in the concentrations used. No renal irritation has thus far occurred from antrum or sinus lavage. In many ways, therefore, metaphen, 1:5,000 to 1:10,000, seems the most useful organic mercury compound thus far available to the otorhinologist. Its bactericidal power seems about equal for staphylococci and streptococci.

The simplest method for nasal administration of the various dyestuff solutions is by the medicine dropper; no chemical change occurs as in atomizers with metallic parts, and the amount can be carefully regulated. Excessive quantities should be avoided. Usually five to ten drops is ample, with the head held well back, to flow over the turbinates into the epipharynx, whence it is expelled by hawking gently, not by blowing the nose. The latter process is likely to be overdone, with re-

sultant prejudice to the integrity of the eustachian tube. Beck's procedure, of suddenly tipping the head forward, then back, while the fluid still remains above the soft palate, often is effective in causing the antiseptic to reach the sphenoethmoid recess.

Weaker solutions may also be dropped in the ear after preliminary swabbing. A patent eustachian tube may cause some excitement by admitting the disagreeable taste or violent color of some concentrated agent to admixture with the nasopharyngeal secretion. Mercurochrome has in a very few cases, when swabbed in, given rise to a severe dermatitis and even a furunculosis of the meatus. This has seemed always to run parallel with an intolerance for mercurochrome in the nose. Metaphen, which is far less concentrated as used, has so far given no local trouble of this kind.

Neither mercurochrome nor metaphen solutions may be used for 24 to 48 hours before nasopharyngeal or ethmoid cultures are taken. This we have repeatedly tested, finding practically negative cultures for periods varying from 6 to 24 hours. Hemolytic organisms seem especially vulnerable to these bactericidal agents. Culture after 48 to 72 hours has, however, invariably demonstrated the reappearance of previously identified organisms, which had doubtless remained in the ethmoid and sphenoid ostia or under the middle turbinate. We have, therefore, found it desirable to continue the use of these antiseptics at least one week, and preferably to four weeks in non-surgical cases, or occasionally in the after care of various surgical procedures. Marked changes in the bacterial flora will be found after such a course of treatment, often eliminating completely several of the original species found. Since pathogenic varieties have seemed rather vulnerable to these agents, we have been encouraged to continue the use of such convenient antiseptics and to counsel their employment as prophylactic against colds, rather than the much exploited and overrated chlorin gas.

In a recent epidemic of anterior poliomyelitis, the organism of Rosenow was isolated from the throats of four of a series of ninety possible contacts among well persons examined as possible carriers. Metaphen, 1:5,000, was used as a prophylactic in these carriers, and so far none of the four has devel-

oped the disease nor have cultures toxic to rabbits been found since. Detailed studies will be completed later. It is hoped that a full study of the action of mercurochrome and metaphen upon this organism may be made in this series, upon the analogy of their excellent bactericidal quotient in tests upon other streptococci. A subsequent report upon this matter will be made elsewhere.

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## LXXIII.

### THE SPEECH COMPLICATIONS INVOLVED IN CERTAIN TYPES OF INADEQUATE PALATE, ESPECIALLY CONGENITAL SHORT PALATE, WITH EXHIBITION OF PATIENTS.\*

BY ELMER L. KENYON, M. D.,  
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#### DEFINITION OF INADEQUATE PALATE.

From the speech standpoint an inadequate palate is one that is capable of completely closing the oropharyngeal nasopharyngeal isthmus for speech purposes. This closure may be accomplished, (1) entirely by the palatal structure coupled with the controlling action of the palatal musculature; or (2) by the palatal structures (of themselves alone usually inadequate) plus the assistance of muscles extrinsic to the palate, especially the superior constrictors. An inadequate palate is one that fails to completely close the pharyngeal isthmus for speech purposes, either with or without the aid of the extrinsic palatal muscles. If the palate of itself alone is organically incapable of completely closing off the nasopharynx, it is to be hoped that the associated extrinsic muscles may attempt their assistance in overcoming the deficiency. This aid does spontaneously develop in a certain, but limited, percentage of the cases of organic palatal self-insufficiency.

Inadequate palates are due to: (1) congenital cleft; (2) congenital insufficiency without cleft ("congenital short palate"); (3) injured palate (by disease, traumatism or operation); (4) paresis; (5) functional insufficiency.

The primary purpose of this presentation is to study speech complications, and not palatal defects. When the secretary requested me to take this meeting, I happened to have certain patients under observation who I thought would be of interest to other physicians. They are chiefly patients with congeni-

\*Address before the Chicago Laryngological and Otological Society, February 2, 1925.

tally short palates, and I shall largely base my presentation on these patients.

It is universally understood that uncompensated palatal defect results in a voice possessing open nasality; but it is not generally understood that such defects also produce other types of speech disturbance, sometimes even more important than the nasality itself. In one of the cases herewith presented four distinct types of speech disorder are present, and in two others, three types.

#### THE CONGÉNITAL SHORT PALATE.

Little has been written, and little is known, concerning the origin of the congenital short palate. By ordinary examination such a palate appears normal, both as to structure and to movement. Only on close comparative study is it found inadequate to close the pharyngeal isthmus on phonation. The voice is necessarily to a greater or less degree nasal.

In the case of a congenitally short palate the length of the soft palate (b—d, Fig. 1) is inadequate, under the conditions of palatal action, to accomplish the closure of distance e—b. In some patients (Case No. 1) the distance b—d is by measurement definitely less than distance b—e. In other instances of congenital short palate these two distances may be nearly alike (Case 2) and yet the palate be unable to reach the pharyngeal wall. This is explained by the evident fact that the soft palate requires considerable more length than that indicated by the distance b—e in order to allow for its necessarily irregular curved form when in actual action to close the palate.

If the soft palate be organically and congenitally inadequate, the inadequacy, it has been maintained, is due to deficiency, not in the soft but in the hard palate. Tending to substantiate this assumption, one finds by palpation in certain congenitally deficient palates a central indentation, or defect, pointing forwards, in the posterior border of the hard palate. (See Fig. 2.) This is said to be a miniature of the larger defects of like character found in cleft palates. Such an indentation is present in Case No. 1. On the other hand, this defect sign in the hard palate is not always definitely present in these cases. Such is the fact in our Case No. 2. Moreover, the indentation is present in certain cases of entirely adequate palates.

For the present I am compelled, for want of a better reason, to explain some of these cases by assuming that Nature at times and for unknown reasons skimps in supplying sufficient length for the soft palate. (Fig. Insert 2.)

#### SPEECH COMPLICATIONS.

From the speech standpoint, the congenitally short and similarly impaired palates (like, for example, Case No. 3) are more dangerous than cleft palates. This is because the cleft palate is understood and is known to require not only operation, but also especial speech attention, while the other types, not being understood, are as to the speech allowed to drift indefinitely. This leads to the serious situations illustrated by our first three cases. Each of these patients suffers from three distinct types of speech disorder: (1) open nasality, (2) disordered articulation, (3) abnormally high pitched and monotony of voice. In addition, patient No. 1 stammers.

All of these speech defects are dependent on the fact that the palatal inadequacy dates from birth, or (Case 3) from early childhood. In Cases Nos. 1 and 2, the articulative defects are so great as to render the speech in large part not understandable. In Case No. 3, whose palatal inadequacy began at three years, after speech had begun to develop, the articulative defects have never been so severe as in Cases 1 and 2, and have now largely disappeared. The nasality, however, is most severe in Case No. 3, and least evident in Case No. 1. In the latter patient the "palatal accessory muscles," the superior constrictors, have entered into the effort to close the palatal breach and have become of such aid to the shortened palate (more inadequate than in either of the other two patients), that, when talking at his best, the nasality entirely disappears.

In each of these first three cases the voice is produced monotonously at a uniform pitch much higher than the natural voice of the individual. The thyroid cartilage (determined by finger palpation), instead of playing normally downwards and upwards as the particular sound demands with each normal effort at voice production, is held steadily upwards against the hyoid bone.

As to the origin of the high pitched monotony of voice in such cases, I am prepared at this time to say but little. I began to observe the tendency to abnormally high pitch of voice in open nasality cases some six or more years ago. The relationship between the nasality and high pitch is not limited to patients with organic nasality alone, but occurs also in some cases of functional nasality. Monotony with high pitch occurs also without nasality, as in the falsetto voice of puberty. I believe that in the open nasal voice the high pitch is a secondary phenomenon and is related psychologically, and perhaps also organically, to the nasality. My attention was called to these cases through systematic study of the action of the extrinsic laryngeal musculature by finger palpation of the thyroid cartilage in talking. Further comment on the origin of this phenomenon of high pitch in open nasality patients must be left to the time when it is better understood. Nor can I here discuss its corrective treatment, excepting to remark that in intelligent patients correction is always possible and that intelligent use objectively of the movements of the larynx is very helpful in the procedure.

In children with marked open nasality the defects in articulation, which often are many and serious, are dependent on the early and continuous disturbance of the psychophysiologic processes of speech development, resulting from the inadequacy of the peripheral apparatus to respond fully to such psychologic processes. The effort of the child to reproduce the word as spoken by others is from the start largely thwarted by the nasality of quality due to the palatal defect. Thus psychologic confusions and discouragements arise. These tend to cause the particular child to waver in, and ultimately even to cease, the normal continuous psychophysiologic effort of improving his reproduction of the heard word. Consequently many such persons in later life continue to respond for speech purposes to the memories established in the motor word center in early childhood, and retained there with little self correction.

These serious lapses in the psychophysiologic processes of learning to talk are quite regular occurrences in congenital palatal inadequacy, including that of cleft palate. Since the later eradication of the articulative defects is out of all proportion more difficult than their prevention, every case of in-

adequate palate, including especially cleft palate, should have, as a matter of routine, the guidance of a skilled expert in speech training from the moment the speech has begun.

#### CASE HISTORIES.

The first three of the following five cases are those especially referred to in the above discussion. Cases 1 and 2 are examples of congenital short palate; the third is a case of paretic palate resulting from a serious infective disease at three years of age.

Case 1.—N. E. T., male, white, age 17. (Date of history, December 20, 1924.)

Father of patient had some manner of speech disorder when a child. Patient was born at full term, instrumental delivery; eight pounds; in first year, pneumonia, light attack. Speech began early in second year. Later the parents realized that the speech was not developing normally, but they felt that the defect would be outgrown. At seven years a laryngologist reported that the tonsils and adenoids were large and should be removed. He stated that the wrong speech condition resulted from a "congested throat." No improvement in the speech followed tonsillectomy and adenectomy.

No improvement occurred in the speech until he entered a Chicago high school and came under the care of Miss Margaret L. Powers, the special speech teacher. Is in good general health and intelligent, being now in his third high school year. In the speech clinic at Rush Medical College he has shown excellent capability of improvement under the guidance chiefly of Mrs. M. B. Berg.

Voice is monotonous and high pitched; moderately nasal in quality; articulation is so defective that patient cannot usually be understood. The most striking defect is the substitution of whispered for normally loud sounds; b is usually p; d is t; g is t, etc., and this occurs in the beginning of words, although more within the word and at the end; the r, g, ng and j sounds appear not to have been acquired; others are used wrongly in various ways; the endings of words are usually either elided altogether or made carelessly or wrongly.

The thyroid cartilage is held steadily upwards, out of its normal movement position in talking.

The nose has caused trouble for years; a chronic nasal accessory sinus disease is probably present; occlusion occurs alternately.

Palate appears as a whole normal; no palatal cleft visible; uvula normal; posterior pillar on left seems to be normally inserted in posterior lateral wall; anterior pillar on left is present, but adherent to posterior pillar in upper half. Posterior pillar on right is displaced anteriorly from its normal insertion; right anterior pillar is absent. Distance of lower border of soft palate to posterior pharyngeal wall seems unusually large to the eye; it is  $1\frac{1}{4}$  inches; anteroposterior length of soft palate at center (f—d, Fig. 1) is 1 inch; posterior border of hard palate shows irregular indentation at center, as if of slight concealed cleft; this center of posterior border is opposite posterior part of first molar tooth.

The soft palate appears to be normally constructed and the hard palate slightly shortened. Soft palate seems incapable of reaching posterior wall for phonatory purposes. On phonation the superior constrictors contract strongly in a compressive effort towards each other, while the soft palate moves upwards and backwards, so that, together, the nasopharyngeal isthmus is nearly though not entirely closed. Small deposits of lymphatic tissue in pharynx, especially on right; nasopharynx free; some mucopusslike secretion; hyperemia of entire pharyngeal region.

**Case 2.**—E. N., female, age 15. Birth was prolonged, 25 hours; no instrumentation; 8 pounds; seemed normal at birth. Was not strong in babyhood at any time; at  $1\frac{1}{2}$  years had severe indigestion for six weeks; brought up in country; moved about much; has had measles, smallpox and mumps.

Speech began at  $2\frac{1}{2}$  years; Polish only language spoken in family; English was not begun until patient went to school at seven years. Speech nasal from birth and developed badly as to enunciation in Polish and later in English; has been in school seven years; is now in sixth grade; was told tonsillectomy would help speech, and in September, 1923, the operation was performed; no change in speech; now seems in good health.

Speech is unpleasantly nasal; monotonous; high pitched; articulation so bad that understanding is only partly possible;

has difficulty in singing. All elemental sounds are produced, although some imperfectly. The s, z and l sounds are most defective. Visualization of the word is highly defective, as shown by the seriously imperfect results in most of the words attempted. End sounds of words are habitually omitted (for example, walk is w-aw); reproduction of words is often wide of the mark.

Nose is considerably occluded by large lower turbinates; no hyperemia or secretion.

Palate in general appearance is normal; edge of hard palate seems to finger palpation rough, irregular; not certainly shortened; border of soft palate is far removed from posterior pharyngeal wall; barely long enough to reach it, even on pressure backwards and upwards by instrument; makes effort to move in the normal way.

Tonsils absent; anterior pillars almost absent; posterior pillars seem intact, but they progress from above downwards practically in a vertical direction, instead of slanting gradually backwards as is normal; this suggests that they probably have been pulled forwards by scar tissue; soft palate seems to hang vertically straight across throat, instead of slanting backwards.

Nasopharynx, free.

Chest: Heart sounds extremely rapid, irregular, no murmurs detected; probably a nervous phenomenon.

As patient talks the anterior superior tip of the thyroid is held steadily upwards in an abnormal and strained position.

The tongue can be protruded normally but cannot be curled upwards completely.

Case 3.—L. K., male, age 13. Full term baby, birth normal, weight 9½ pounds, breast fed; teeth at four months; measles at 8½ months; walked at eleven months; speech started, mother believes normally, at eleven months. Pneumonia at eighteen months, with recovery; also earache, recovery. At end of second year, mother believes speech was developing normally. During the third year patient was terribly frightened when house was ransacked by burglars; patient cried and screamed at short intervals all night; pleuropneumonia developed, the doctors said, from fright; patient was very dangerously sick; during the period of sickness, mother

noticed that the speech was greatly retarded; during convalescence she realized that the speech had become nasal in quality; because of this the doctor recommended tonsil-adenoid operation, but owing to the weakness of the patient this was delayed. The nasality increased during the fourth year, and the mother noticed that the initial consonants were dropped. During the fourth year chronic bronchitis and croup. Sixth year, voice the same, started school. Seventh year, bronchitis continued; family moved to New Orleans because of it; speech remained the same. Ninth year, operation for tonsils and adenoids; before throat was healed, operation for appendicitis was necessary. Tenth year, moved back to Chicago. Speech continued unchanged until present time; now 13 years old. Before the tonsil-adenoid operation the mouth was held wide open, day and night.

The voice is thin, very nasal, high pitched and monotonous as to pitch; enunciation moderately careless, but all elemental sounds are produced.

Nose is essentially free, slight hyperemia.

Palate appears well formed and complete; distance from free border of palate to posterior pharyngeal wall about three-quarters of one inch; distance from posterior border of hard palate to free edge of soft palate, about 1 inch. Distance to posterior pharyngeal wall is coverable by soft palate on actual trial by instrument pressure, possibly with some stretching; on phonation the soft palate moves upwards and backwards but towards the left rather than directly upwards and backwards in the median line (possibly right side of palate has not fully recovered from presumable paresis during third year).

Excellent tonsil result; anterior pillars are shortened, but present; posterior pillars are undisturbed.

Case No. 4.—P. W. is a girl of seven, in whom extreme nasality of the speech immediately followed tonsillectomy at five years. I strongly suspect the original existence of congenitally short palate in this patient. Full report of this case will be made at another time and place. The patient is presented here, in order that others may now confirm my findings when they shall be reported. On this occasion I have not time for discussion of the tonsil-adenoid operation as related to nasality of the voice.

Case No. 5.—P. S. is a boy of five years, whose palatal inadequacy was due to complete congenital palatal cleft with harelip; operated on seven times between the ages of five weeks and 4½ years; operations, first two by Dr. Vaughn, and last five by Dr. Frederick B. Moorehead. At the beginning the deformity was extreme, and the anatomic results of operation, so far as is evident, are very fine. The palate reaches to one-half inch for the posterior pharyngeal wall, and is intact excepting for two small defects anteriorly, that have no appreciable effect in producing nasality. The open nasal voice in this case is due to the failure of the velum to elevate on phonation; only a very slight, unimportant movement of the palate can be discerned.

The voice is not only nasal, but the speech is impaired by many and serious articulative defects, the result of combined anatomic and psychologic causes.

The muscles constituting much of the body of the soft palate appear, owing to the exigencies of operation, to have been so mutilated as to be now practically incapable of adequate functioning. Thus the important cooperative pursestringlike action of the elevator and the palatopharyngeus muscles within the palatal structure itself seems to be hopeless of development.

The distal portions of the elevator muscles lying outside the palate are presumably intact, although, of course, undeveloped as to strength. If the operator has severed these muscles outside the palatal structure, which is sometimes done as a step in the reconstruction of the palate, they can never, of course, be of the slightest service to the patient in overcoming his nasality.

#### THE SPEECH PROBLEMS OF INADEQUATE PALATES.

While many cleft palate patients obtain, through operative correction, especially supported by speech training, a very excellent speech, nevertheless, in general, the ultimate outcome of these patients, from the speech standpoint, is far from satisfactory. The expert in speech disorders must accept all such patients "as is" and attempt to refashion their efforts at speech and voice production, in accordance with the anatomic and functional deficiencies of each patient. From the speech standpoint, the subject with congenital short palate is apt to

be in a worse situation than he would have been if his palate had been cleft. This is because, as has already been said, the latter type of defect is understood and easily diagnosed and is largely known to require not only operative but also especial speech attention. The two first cases presented herewith, in each of whom the gross appearance of the palate is deceptively normal, now, at ages of 15 and 17, present serious speech problems, more important even than those of Case 5, whose palate was seriously cleft. The last patient still has all the important years of late childhood for speech training, a highly important consideration.

If the condition of disordered speech in connection with inadequate palates is ever to be placed on a footing that is fully just and sufficient for the patient's requirements, it is necessary that especially the physicians concerned, but also the public, shall realize certain facts: First, that the anatomicophysiological disturbances attendant on inadequate palates result often in serious disorders of speech other than that of nasality; second, that disorders of speech become psychologically more and more deeply seated and difficult of eradication in accordance with the length of their continuance; third, the effect psychologically of impaired speech on the development of character, on the happiness of the child, and on the inculcation of unfortunate social behavioristic reactions, is on the whole important; fourth, the overcoming of an established correctible disorder of talking is almost always out of all proportion a more difficult and prolonged and expensive procedure than prevention would have been; and, finally, the knowledge and experience which one competent in speech development and training can throw into the guidance of children tending to develop functional speech disorders is of much value, and usually is both necessary and capable for their prevention, as well as for their correction. Such aid should be sought as soon as difficulties in speech development are even anticipated; the speech expert should, for example, in cleft palate cases work hand in hand with the palatal operator in order to prevent unnecessary speech disorders.

#### TREATMENT OF OPEN NASALITY.

With respect to the improvement or elimination of open nasality in cases of inadequate palates, the principles involved in

training methods may be briefly stated as follows: First, obtain all possible action of the palatal elevators; second, cultivate the vocal possibilities as a whole; and, third, encourage the accessory activity of the superior constrictor muscles in closing the palatal isthmus. The second and third of these principles are, so far as I know, here presented for the first time.

The individual has no direct conscious control of the soft palate for speech purposes. The child with normal palate secures its physiologic action in talking by the process of visualizing the quality of the sound desired, whether oral or nasal. In the child with an inadequate palate, the same basal principle of effort must be relied on. Here, however, serious complications, often requiring much ingenuity for their overcoming, are usually present. The most important of these is the inability of the palate to respond sufficiently to produce an oral tone, first, possibly, because of its shortness, and second, because of weakness or injury of the palatal muscles. The patient is first taught the difference of quality between the oral and nasal voice as heard in others; and then, through different schemes, as, for example, to talk in, or out of, the mouth, rather than out of the nose. Thus persistent effort to produce voice with the oral quality of the tone clearly in mind is carried out. The plan involves beginning with the simplest problems, especially certain more easy vowel sounds, and on to combinations of simple sounds, to words and finally sentences. In older patients, if the faucial region is not too sensitive to foreign bodies, the education of the patient's ear to visualize his own normal sounds, can be aided by closing the palatal isthmus for the patient, through instrumental pressure upwards and backwards against the soft palate.

During the entire procedure of attempting to encourage oral quality in nasality cases, it is my custom to carry on at the same time the development of the larger possibilities of the voice in general. I mean by this to develop chest action, vocal cord action and resonance in exactly the same manner as is used to develop the artistic speaking voice. The benefit of such procedure is threefold: First, to partially bury the nasality by an improved general tonal result, and thus to make easier visualization of oral quality by the patient; second, to improve the quality of tone, whether nasality eventually remains or

not; and, third, if nasality does remain, to have it partially overwhelmed by the more effective general vocalization. This procedure is physiologic and very valuable. The whole training is necessarily time consuming.

At present I have no report to offer concerning the plan of securing by training the cooperative aid of the superior constrictors, such as sometimes develops spontaneously in open nasality patients. The action of the superior constrictors in aiding the crippled palate where such action develops, is probably analogous to their action in the physiologic processes of gagging and swallowing. The idea of training the patient to produce these accessory movements of the superior constrictors in talking has only recently entered my mind, and I can only hope to have something to offer on this subject later. If this aid can be elicited by training somewhat at will in palatal speech cases, the benefit promises to be great enough to place the procedure among the important discoveries in medical progress. I speak of the subject at this time in order to encourage others in the work of speech training, to take up this important research problem.

#### MATTERS OTHER THAN NASALITY.

The subject of training in articulative disorders of speech, which for the palatal patient differs from other classes of patients with the same kind of disorder only as to details, has no particular place in this discussion. To uproot wrong memories of long standing, in the cerebral speech centers, and to replace them by others that are correct, as well as the difficulties in restraining peripheral muscular action, are extremely tedious and difficult.

Any disorder of speech in the young child that tends seriously to produce embarrassment in his social relations is capable in susceptible children of superinducing stammering. This disorder is not, as to numbers, conspicuously present in cases of inadequate palate, but one need not be surprised (especially if such patients have been neglected with respect to speech complications) if it should occur.

In closing, I must earnestly disapprove of the widespread tendency of physicians to remove the tonsils and adenoids for disturbances of speech, almost regardless of what the speech

disorder may be, and without realization on the part of the operator of the possible effect on the speech of the proposed operation. In Cases 1 and 2 the tonsil-adenoid operation served definitely to make correction more difficult. In Case 4 the voice disturbance resulted directly from the same operation. In Case 5, supposing that considerable adenoid tissue were present when the patient was operated on, adenectomy served to make the attainment of oral speech harder.\*

#### SUMMARY AND CONCLUSIONS.

1. The congenital short palate is little understood and, while rare, may be more common than we are now aware of.
2. The speech complications of the congenital short palate, while the same in kind, are, because of their habitual neglect, apt to be even more serious than those of cleft palate.
3. The speech disorders arising from inadequate palates involve open nasality, serious disorders of articulation, high pitched, monotonous voice, and, rarely, stammering.
4. The psychophysiologic speech complications of inadequate palates are in many cases more serious than the open nasality, although the latter is the more direct result of the anatomic defect.
5. In all instances of functional speech and voice disturbance, prevention is out of all proportion more economical of time, effort and psychologic disturbance than corrective training.
6. Therefore, expert speech guidance should accompany the development of the speech in all cases where functionally imperfect speech development is seriously to be feared, as in cases of inadequate palates.
7. Corrective training of the open nasal voice is not so simple as is generally presumed, and offers an important opportunity for research.
8. Speech disorders in general should not be presumed by physicians to be a reason for tonsillectomy or adenectomy; for, on the other hand, they are quite as likely to constitute an important argument against, as for, this operation.

\*This subject will be fully discussed on another occasion.

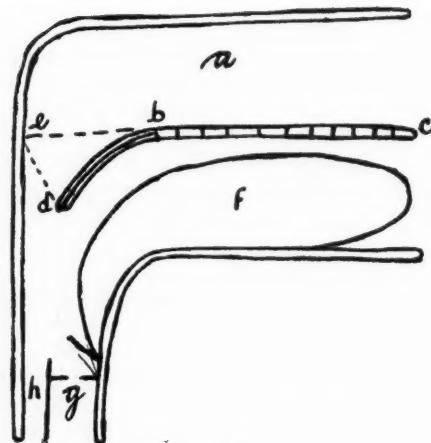


Figure I.

a, nose; b—c, hard palate; b—d, soft palate; f, tongue; g, vocal cords;  
h, esophagus.

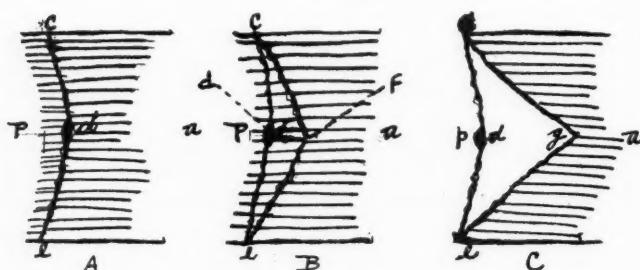


Figure II

a, anterior; p, posterior; c, d, e, normal posterior border of hard palate; c, f, e (drawing B), posterior border of hard palate in Case I; c, g, e (drawing C), posterior border of hard palate in certain cases of cleft palate. In drawings A and B the mucous membrane extends backwards intact, forming the soft palate; but in drawing C the soft palate is also cleft, and the central part of the soft palate is absent.

## LXXIV.

### SOME PATHOLOGIC FINDINGS IN THE HEAD DURING AVITAMINOSIS.

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Deficiency of vitamins or accessory factors has been shown to have very definite pathologic effects on experimental animals. Some of these pathologic effects are known to have analogues in human pathology. Socalled xerophthalmia was one of the first pathologic effects of vitamin deficiency noted in the heads of experimental animals. There is no longer much room for doubting that an etiologically and clinically identical condition occurs in the human. The pathology of xerophthalmia, as it occurs in rats, has been carefully studied by Yudkin and Lambert.<sup>1</sup>

Formerly it was generally believed that the primary lesion of xerophthalmia occurred in the cornea, but the work of Yudkin and Lambert indicated that the initial lesion occurs in the eyelid and nictitating membrane. These early lesions consist of inflammatory foci. Later the corneal lesions appear. The early corneal lesions consist of plaques of keratinized epithelium. Ulceration of the cornea may occur later and may be followed by panophthalmitis.

In seeking further for the pathogenesis of the eye lesion, Yudkin and Lambert<sup>2</sup> made histologic examination of the paraocular glands. They found suggestions of pathologic change in the lacrimal and meibomian glands and marked changes in the Harderian glands. The changes in the Harderian glands were degenerative and inflammatory in nature. "The degenerative changes consisted of swelling, vacuolation, and occasionally complete epithelial disintegration." The inflammatory changes were either acute or chronic. Suppuration was occasionally found. It is interesting to note that a degenerative change in the esophageal glands of chickens is associated

with a diet deficient in fat soluble A vitamin. This degenerative change appears to be very similar to that which Yudkin and Lambert described as occurring in the Harderian glands of rats on a fat soluble A deficient diet.

The possible relationship of fat soluble vitamin A deficiency to purulent conditions in the nose and ear was suggested by the observations of Daniels, Armstrong and Sutton.<sup>3</sup> These investigators consistently found purulent material in the paranasal sinuses and mastoid cells of rats that had been on a vitamin A deficient diet for six to eight weeks. They also found the middle ear filled with pus. Anyone who examines rats that are subnormal as the result of being kept on vitamin deficient diets is impressed by the frequency with which purulent conditions occur in the middle ear and in the nasal and paranasal cavities. However, such purulent conditions are not limited to rats on vitamin A deficient diet. They have been frequently found in animals suffering from the effects of a vitamin B deficient diet. In accordance with the findings of Findlay<sup>4,5</sup> and of Werkman,<sup>6</sup> it appears very likely that there is a general decrease of resistance to bacterial infection during avitaminosis.

The possible relationship between the rachitic process and otosclerosis has been suggested by Kauffman. Instead of considering the pathologic changes associated with this condition as being superimposed on previously normal bone, he suggested<sup>7</sup> that the process may be essentially rachitic in nature. Later Kauffman, Cheekmur and Schultz<sup>8</sup> published the results of a study of the microscopic changes which occurred in the bones of the base of the skulls of rachitic rats. After studying the minute changes which occurred in the temporal bones, the auditory ossicles, particularly the stapes—and the auditory soft tissues of the rats, these three investigators concluded that the changes found "can rightfully be considered as precursors of the clinical and pathologic entity known as otosclerosis."

If this opinion regarding the true nature of otosclerosis or otospongiosis should prove to be correct, the way may be opened for an explanation of other clinical and pathologic entities of obscure etiology.

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LXXV.

THE PRESENT DAY ADVANCE IN PLASTIC SURGERY, WITH SPECIAL REFERENCE TO THE CORRECTION OF DEFORMITIES OF THE NOSE AND ABOUT THE ORBIT.

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The progress in the art of plastic surgery has been largely due to the present day knowledge of asepsis, the development of surgical technic and the influx of clinical material during and since the World War. Because of the various injuries and disfigurements received during that time, great strides have been made, with the result that plastic surgery has been placed on a firm basis and is now recognized as a distinct and separate branch of surgical science.

To those who prefer to think of the man of today as being different to what he was centuries ago, and who are not familiar with his history, it is, no doubt, astonishing to learn how early in the practice of surgery attention was called to the need of plastics, and how this gratifying art was practiced by the ancients.

To Alus Cornelius Celsus, a Latin physician and philosopher, who is supposed to have lived at the time of Augustus, do we owe our first authentic principles of the science. He introduced the Hippocratic system to the Romans, being known as the Roman Hippocrates. His best work appeared in the *De Medicina*. The first edition was divided into eight books and appeared in Florence in 1478; the seventh and eighth volumes, designated "The Surgical Bible," contained much interesting and valuable data with reference to opinions and observations of the Alexandrian School of Medicine. In con-

sidering plastic operations about the face, Celsus described his methods in detail, but centuries elapsed before a clear understanding of those methods was deduced. This is the oldest known reference to plastic surgery, and the name of this pioneer is still found in many of our present day standard works on surgery. Reference is made to the art in the Sanskrit writing and, from the Orient, Susrata, in his Aywr-Veda (the exact period is unknown), discloses the use of the rhinoplastic method.

The art of plastic surgery seems to have waned throughout the Middle Ages, and to have remained practically unknown for a time, until a revivalist appeared about the middle of the fifteenth century. Branca of Catania, a Sicilian surgeon, established a reputation by building up noses, using the skin of the face. Later, his son, Antonio, enlarged upon his father's methods by utilizing the integument of the arm to bring about the same results, thus avoiding the scarring of the face. He seems to be the first authority employing the socalled Italian rhinoplastic method. Balthazar Pavoni and Mongitare used these methods of operative procedure with some success. Then, in Germany, Heinrich von Pfohlspundt wrote a book on the subject, entitled "Buch der Brundth Ertzeni," which appeared in 1460.

Kaspar Tagliacozzi, professor of Bologna, followed the art of rhinoplasty, and his pupils published a book at Venice in 1597, entitled "De Carturum Chirurgia per insitionem," which was the first authentic volume in restorative surgery. His operation for restoring the entire nose by taking a double pedicle flap from the arm still bears his name.

Following this period came a century of forgetfulness, the scientific world taking no cognizance of the work until 1794. Word came from India that a peasant following the English army had been captured by tribesmen, who had cut off the prisoner's nose. His wounds were dressed by English surgeons. The victim was befriended by the Koomas, a religious sect, who possessed a knowledge of the restoring of the nose by means of skin flaps taken from the forehead. The results of the operation were satisfactory, and the case was later reported in English by Pennant.

In 1811 Lynn successfully operated in England. France then took up the art of rhinoplasty. Delpech introduced his method in 1820, which was known as "a modified Koomas." This operation was performed in Paris by Lisfranc in 1826. In 1816, Graefe of Germany did extensive work, and in 1823 Bungar of Marburg successfully made a nose by taking the graft from the patient's thigh. In 1831 Thomas D. Multen published the results that he had obtained in America. The credit of first collecting data of plastic operations belongs to Zymanowski of Russia, and is mentioned in his volume of surgery, published in 1867. Following this period Reverdin, in 1871, added a valuable method to the art by introducing the circular epidermal skin graft for covering granulating surfaces. In 1886, Thiersch improved this method by transplanting comparatively large pieces of skin. Wolfe of Glasgow also successfully transplanted large grafts, and, following this, Krause improved upon all these methods by transplanting large flaps of skin without detaching the subcutaneous tissue.

All varieties of foreign substances have been used to raise sunken noses. Metal and glass forms have been used to replace extirpated testicles and to take the place of vitreous humor of the eye. (Mule.)

Then came Gersuny with his method of injecting paraffin subcutaneously for the restoration of facial contours, which has led to disastrous consequences in various ways. Among the present day advocates of reparative surgery are Gillies of London, Joseph of Berlin, Wheeler, Sheehan and Carter of New York and Cohn of Baltimore.

The professional mind was directed to reconstructive surgery originally because unfortunates, with mutilated noses, wanted relief. Rhinoplastic operations gave birth to a knowledge of the physiologic possibilities of reparative surgery. Let us contrast the surgeon of old, untrained as to technic, working against overwhelming obstacles, with the great armies of infection ever present to batter down his ceaseless struggle toward accomplishment, and the present day surgeon, with his thorough training in all branches of medical science and almost faultless technic and abundance of clinical material, largely the result of the World War, operating under ideal

aseptic conditions, with trained assistants and working in collaboration with dentist, artist or sculptor, who are able to cast the defect to be repaired and who can advise the surgeon before he operates. Success in the domain of plastic surgery can only be secured by those who are familiar with certain mechanical principles. To trust to the eye and to the inspection of the moment may answer for him who has had much practical experience in the art, gained by a careful study through a wealth of clinical material. For the less fortunate, who have not had such advantages, trusting for the moment to lucky guidance, may not prove as satisfactory for him as the pilot who guides his ship by a single star and does not rely upon a compass. He may touch a thousand ports before safely arriving at the intended one. Each case is a problem unto itself and requires careful study and forethought in order that any degree of excellence shall be attained.

Many new methods have been tried, with varying degrees of success, and, due to the untiring efforts of some of the most capable surgeons, this branch of surgery is now a recognized art, applicable to the deserving who have suffered the wounds of battle, and not limited to satisfy the vanity of the less comely. It has taken the art out of the hands of the so-called beauty specialists and placed it on a firm and scientific basis, thanks to the efforts of some of our foremost surgeons, and serves as a surgeons' contribution to humanity.

It will not be amiss to discuss briefly a few of the fundamental principles which are confronted by those entering the field of plastic surgery, and to enumerate a few of the essentials that, if observed, may save one from many pitfalls and serve to further demonstrate the underlying principles which lead to success. It goes without saying that those venturing into the field of plastic surgery should be disciples of Job, as patience and painstaking are two very essential factors. The desired results cannot be always obtained at one sitting, and the surgeon should be ever patient to wait and give Nature a chance; a little at a time done well is far better than a gross attempt to accomplish the impossible at one sitting, which oftentimes spells failure and discouragement.

Plastic surgery is not what some may think. It is erroneously believed by many that it is a dramatic field filled with

glamour. How often does such an idea culminate in tragedy, and the overzealous and hurried surgeon finds that his labors have proved a failure. The temperament of the operator is of importance; here an artistic temperament is the *sine qua non*, for the ability to create and build lends itself admirably to this branch of surgery, for in reality the surgeon but attempts to rebuild as artistically as possible that which has been destroyed or faultily cast by Nature. The light touch of the surgeon is a quality which should be developed. The ability to use instruments whenever possible without resorting to digital manipulation will often prove a valuable asset, especially in the handling of skin grafts. The value of tissue conservation by the careful preserving of all tissue is a point that cannot be too largely stressed. Rough handling and tearing of tissue hinders nutrition, favors necrosis and increases the chances of secondary infection.

We must not, in an attempt to correct deformities, create or leave behind blemishes equally as gross in appearance. We should endeavor to secure careful approximation of raw surfaces with as little tension as possible, by using the finest suture material, preferably catgut for cutaneous sutures, as it is the least irritating, and control hemorrhage by pressure when possible, thus avoiding the burying of sutures, which may act as a bed for bacteria. This does not apply to the control of bleeding from large vessels; when necessary, catgut is preferable because it is absorbed.

Due consideration must be given to the selection of material for repair, the site of selection and the ease with which it can successfully be shifted into a new position. Skin flaps should be of healthy tissue, containing no scar tissue, with pedicle of sufficient size to afford an adequate vascular supply and as little twisted as possible.

Grafts placed in their new position should lie in their new place with the least possible tension, with thorough coaptation of edges. The free use of relaxation sutures should be used (subcutaneous sutures to relieve tension). The lack of proper asepsis and faulty judgment on the surgeon's part are often the cause of a large number of failures.

Foci of infection, when existing, should be first dealt with and cleared up before attempting operative procedure. This, I

think, holds good in plastics on any part of the body and is especially true in plastics about the head and face. One would surely not attempt to perform a plastic operation on the nose when the patient is known to have an infected sinus, nor would one attempt a plastic operation about the orbit when the lacrimal gland or sac was infected. It, therefore, holds good that these various foci of infection should be searched for and cleared up before operation is undertaken. It is also important to search for constitutional conditions, such as syphilis and tuberculosis, and, if possible, to eliminate these conditions with proper therapy. Having observed the foregoing, one can obtain the desired result in the majority of cases.

In the correction of the various deformities of the nose, where grafting is essential for the formation of the support of the bridge, a variety of material has been used, all of which, in my opinion, has proven unsatisfactory with the exception of three, namely, cartilage, bone and celluloid. As to which of these is the best I shall not argue, as each has been used successfully in the hands of certain operators. When bone is used in rhinoplastic surgery it is usually procured from the rib, tibia or ileum, although I believe a portion of the scapula has been advocated in certain cases, as well as the third digit in other cases where there has been total loss of the nose. The turbinate bones (middle and inferior) have also been used with some success in depressed or saddle nose. In cartilage grafting the cartilage of the seventh, eighth and ninth rib and xiphoid offer the selective sites for procuring the graft. In all instances, where bone or cartilage is used, it is important to preserve as much of the periosteum or perichondrium as possible. The proper approximation of raw surfaces and the fixation of the graft must be assured. This may be accomplished by suture, splints or pressure bandages, all of which have their places. In superficial scars of the nose an attempt should be made to procure a graft from some part of the face so that it will match as near as possible the skin of the nose. An adequate amount of skin can be taken from the upper eyelid, which is an excellent match and leaves no disfigurement following its removal. If the area is too large to remove a sufficiently large graft from this spot, the temporal graft is fairly adaptable and the shrinkage is very slight. If

it is necessary for a still larger graft, I use the outer side of the thigh, using Thiersch's graft when possible.

The deformities of the nose encountered are varied: the hook nose, the overhanging tip, the extreme aquiline, the saddle backed nose, the African nose and lateral deformities and exostosis. Each in itself presents a distinct mechanical problem to tax the ingenuity of the surgeon who, before attempting operative procedure, should examine the case from all angles, thoroughly search for the etiologic variation from normal and carefully consider the mode and method for the correction of the deformity. Anatomic variations, due to traumatism, should be separated from those changes resulting from constitutional disease, such as syphilis. Diseased conditions of the paranasal sinuses should be sought for, and rigid treatment carried out before undertaking operative procedure.

The choice of the anesthetic is of no great importance; local or general may be used with equally good results. However, I frequently leave this to the decision of the patient. I will briefly outline the operation as performed under local anesthesia. The operative technic is applicable to all forms of deformities. The patient is placed in a semirecumbent position and draped for operation. The cilia at the nasal vestibule are clipped with fine scissors. The mucous membrane of the nose is painted with 10 per cent solution of cocaine, to which is added a few drops of adrenalin chlorid. The external nose is then painted with tincture of iodin, which is carried well over both cheeks, up between the eyes and down over the upper lip, and the excess removed with alcohol. The next step is the cleansing of the interior of the nose. A swab of pure alcohol is inserted into each nostril and passed over the mucosa. The injections are then made; a one-half of 1 per cent novocain solution is injected subcutaneously beneath the mucous membrane covering the septum. This is done first on one side of the septum and then on the other. The needle is then inserted in the region of the lateral cartilages, where further injections are made. The attention is next turned to the anesthetization of the external nose, where four injections are made: No. 1 directly over the bridge of the nose; No. 2, directly on the tip; Nos. 3 and 4, respectively, on either side of the nose, well

out over the maxillary bones. Although incisions of the nose heal rapidly, the internal route is preferred, as it leaves no scars and no external sutures, which is important for cosmetic reasons, and the incisions described make it possible to correct all types of defects.

The surgeon begins by making an incision along the pyriform opening of the nose. Beginning at the nasal bone, the incision is carried downward and outward through the mucous membrane and chondroosseous junction. A periosteal elevator is passed through this incision and inserted between the periosteum overlying the nasal and maxillary bones, and the bones are swept mesially and laterally, separating periosteum, subcutaneous tissue and skin from the bone. This freely liberates the entire area extending from the root of the nose over the nasal bones and superior maxillæ. A second incision is made, beginning at the lower end of the nasal bone; it is carried downward and forward along the anterior edge of the septum to the tip of the nose. This incision is parallel to the bridge of the nose and is carried through the cartilage up to the perichondrium overlying the nasal bridge; then by means of dissection the perichondrium and soft tissues over the bridge of the nose and lateral cartilages are separated from the underlying bony and cartilaginous septum and lateral cartilages. A third incision is made from one nostril to the other; starting at the tip of the nose at the end of the second incision it is carried backward along the lower border of the quadrilateral cartilage to the nasal crest of the superior maxillary bone and through the mucous membrane and cartilage. The fourth incision is made through the lower lateral cartilage at the point where the cartilage bends upon itself. Having completed these incisions, one is able to correct all types of nasal deformities. However, when there are reasons for not using the intranasal procedure, such as the presence of chronic sinusitis that will not yield to treatment, it becomes necessary to use an external method of approach (Lewis,<sup>1</sup> Monks.<sup>2</sup>) A vertical incision is made in the lower half of the columna nasi, the lips of which are undermined laterally toward the nasal vestibule. Then by means of a pair of blunt scissors the nasal tip is undermined. This converts the tip into a sort of hood. The hood is then elevated, and dissection is carried as far

upward as desired. This will allow ample room for the implantation of a graft or celluloid form. The incision is then closed by two or three sutures. This method has the advantage of allowing the surgeon to operate under aseptic conditions, as the anterior nares may be packed with sterile gauze or cotton, and the field of operation kept sterile. The disadvantage is that there still remains a slight scar and a depression over the site of the incision.

**Saddle Nose or Fallen Bridge.**—The operative procedure in this case depends upon the elevation of the nasal bones, together with filling in of the depression with a graft of either rib cartilage, trimmed to the desired size, or a portion of a turbinate bone. A chisel is introduced into the nose, and the nasal bones are detached freely from the frontal process of the superior maxillary bones and from the nasal process of the frontal bone. Elevation is then made, sufficient to raise the bridge of the nose; a piece of rib cartilage or turbinate bone, denuded of all save its periosteum and trimmed to the proper size, is then inserted between the anterior side of the bony septum and nasal bones, and is maintained in place by means of a padded metal splint and adhesive plaster. Within three or four days the graft becomes fixed, and in four weeks, as a rule, there is complete organization.

Humped or crooked nose is corrected by means of the saw and rasp operation. The nasal bones are shaved down to the proper level, and the protruding bony and cartilaginous septum trimmed off with scissors or scalpel. The overlying skin is moulded into position to overcome the widening which frequently results after the removal of the hump. By means of forceps the remaining portions of the nasal bones, with the frontal processes of the superior maxillary bones, are forced inward into the desired position. The splint is then applied externally to maintain them in place.

**Lateral Dislocations.**—Before attempting to correct this type of deformity a resection of the anterior part of the bony septum should be performed. This accomplished, the nasal bones, together with part of the frontal processes of the superior maxillary bones, can be dislocated by means of a chisel, and then swung in the median line. Great care should be taken in exerting side pressure for fear of possible fracture of the crib-

riform plate of the ethmoid. The results achieved will depend largely, not only upon the proper observance of asepsis during operation, but also the care of the nose during the convalescent period.

I will not touch upon plastics about the orbit where there has been loss of bony structure, but will limit my discussion to those resulting from the loss of the soft tissues through disease of the part, trauma, postoperative deformities and congenital defects. As to the type of skin graft used in these cases I will refrain from argument, knowing the value of both detached and pedicle grafts, both of which have their places in the armamentarium of surgery, depending upon the type of case under consideration, and the extent of destruction of the soft parts. However, after observing such men as Dr. John Wheeler of New York accomplish such marvelous results with detached grafts, it has led me, through observance and experience, to yield to this type of skin grafting when possible. When making this statement I mean whenever there is not too large an area to be grafted, and when the destruction of tissue has been superficial.

In the use of dermic and epidermic grafts the viability of the graft depends principally upon its contact with the underlying raw surface, and if a thorough approximation of surfaces is obtained the graft will successfully take. The approximation of surfaces is secured largely by the graft being of the proper size, it being retained in place by sutures with as little tension as possible, by the application of pressure bandages and in certain cases dental stent. In securing epidermis by the pedunculated method, it is often a difficult task and may be very disappointing, for the reason that in the use of either dermic or epidermic grafts the nutrition of the graft is largely dependent upon the pedicle. The pedunculated flap must be thick, and the attachment of the graft held in place by sutures throws tension on the vital point, the pedicle, which may, through passive congestion, lead to necrosis and ultimate loss of the graft. The important points are, then, how are we going to secure absolute approximation of raw surfaces and prevent at the same time hemorrhage and avoid the formation of a hematoma. This is important so that the graft will take.

First, both the approximation of surfaces may be obtained and the hematoma may be avoided by firm pressure dressings supported by adhesive tape. These pressure bandages should be maintained in place four or five days following the operation, at the end of which time the dressing is removed and the graft inspected. White, anemic places in the graft make one suspicious of necrosis. The second method of securing the proper approximation of surfaces is by the use of dental stent and is applicable particularly to those cases where there is a desire to skin graft the conjunctival sac, middle ear or mastoid cavities. This method is based on the transmission of the epithelium by the aid of stent. The stent is placed in hot water to soften it, then removed and allowed to partly cool, formed to the desired shape and placed in the cavity that is being grafted. An impression is made of the cavity and the stent is allowed to harden. It is then removed from the cavity, and the graft is spread over the stent, completely covering the stent, with the raw surface outward, and making sure that there is no curling of the edges of the graft. The stent form, with the graft covering, is gently slipped into place and an approximation of raw surfaces is obtained. This is allowed to remain for varying periods, of from one to three weeks, depending on the cavity that is being grafted.

As to the site preferable for procuring the graft in plastic surgery about the orbit, it applies here as it does with any part of the face, the skin from a near by region furnishes a better match than does skin transplanted from remote parts of the body (this does not apply to grafting in orbit, ear or mastoid cavities). Therefore, in small defects, such as cicatricial ectropion or the like, the dermic graft from the upper lid (as suggested by Wheeler) is preferable, because of its likeness to the surrounding parts, and there is no resulting deformity following the removal of the graft. Next comes the temporal region, which offers a very good match, although some allowances should be made for shrinkage. In epidermic grafts the outer portion of the thigh or the flexor side of the forearm is the site of selection.

In concluding, we may briefly add that heretofore plastic surgery has been limited to the repair of wounds or defects

resulting from trauma or disease and certain congenital anomalies. As medicine has progressed, we find surgeons who, a decade ago, would not have thought of performing an operation for cosmetic purposes have drifted away from the orthodox teachings. He has been forced to compete with the quack and beauty specialist. His operations have spread from reconstruction and remodeling of features to skin lifting for the elimination of wrinkles. In my opinion, he is justified in doing so, because an individual with a misformed feature of any kind, even if congenital, is handicapped and it deters his progress socially as well as in business. This is especially true of women. It also alters the mental state of the unfortunate by relieving the obsession of being homely, thus removing the inferiority complex and giving these people an equal chance with their fellow men and women. It also gives them the benefit of first class surgery by skilled operators, thus saving them from many infections that occur in the hands of incompetents. A successful outcome will largely depend upon the surgeon's attention to the following rules:

1. The surgeon should search for the underlying causes of the deformity.
2. He should be familiar with the anatomy of the part to be corrected.
3. Thorough attention should be given to the importance of primary eradication of all foci of infection.
4. The constitutional condition of the patient should be thoroughly understood, and where syphilis or tuberculosis is found proper therapy instituted.
5. The avoidance of creating new disfigurements in an attempt to correct those already existing.
6. Judgment in selecting sites for securing skin grafts; the advantage of securing skin that matches the surrounding parts when possible.
7. Skin flaps should be of healthy tissue, containing no scar tissue.
8. The control of hemorrhage by pressure rather than by burying sutures.
9. The avoidance of roughly handling the tissues by either digital or careless instrumental manipulation.

10. Rigid asepsis and surgical technic.
11. Patience on the part of the operator; the surgeon should not force too much at one sitting. Nature should be given a chance. Also remember the dictum of Gillies, "Time is the greatest ally of the surgeon."
12. A successful outcome will largely depend upon the patient's general condition and the local conditions favoring aseptic wound repair.

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LXXVI.

HEADACHES—THE NASAL ASPECT.\*

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The subject of headache resulting from nasal conditions is such a wide one that to treat it adequately in one evening's dissertation would to all intents and purposes be well nigh impossible, therefore, with your permission, we will confine ourselves this evening to those head pains directly or indirectly associated with inflammatory conditions of one or more of the accessory sinuses connected with the nose.

The phenomena described as pain, or as we will term it tonight, headache, resulting from disturbed conditions within the paranasal sinuses, varies so greatly in all its phases of manifestation as to constitute perhaps one of the most inconsistent and variable evidences in the domain of symptomatology; happily, however, diagnostic clues of much importance may be gathered from this apparent confusion, for, as the old adage has it, "The exception proves the rule," so here the very inconstancy of the headache must bring to mind, certainly to the rhinologist and perhaps also to the astute internist, the probability of a nasal sinus involvement.

Before discussing the individual sinuses with their special characteristics, it might be well for a moment to consider the actual pathologic factor which gives rise to the subjective sensation of pain.

Headache, both as to character, degree and even time of appearance, depends largely upon the pathologic condition present within the sinus, the most important being some form of pressure. This pressure may result in two ways. One in which the lining mucosa of the sinus becomes so congested and swollen as to impinge on the lining mucosa of the opposite side, thus meeting and obliterating the sinus cavity or at least converting it into a slitlike aperture. The other results when,

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\*Read at a meeting of the New York Academy of Medicine, March 19, 1925.

from one cause or another, the drainage passages become more or less occluded, thus causing partial or complete stagnation within the sinus with resulting pressure on the already swollen and inflamed mucosa. A third form which I mention, not so much on account of its importance as for the sake of completeness, is the negative pressure or socalled vacuum headache. While this may play a certain rôle, nevertheless, I believe both its relative appearance, as well as importance, has been exaggerated, for as my experience advances it would appear that this type of headache is becoming less and less in evidence and certainly more and more difficult to prove to one's entire satisfaction.

The pain then is due to pressure exerted upon the nerve endings in the sinus mucous membrane, associated probably with a certain toxicity liberated by the infecting micro-organism. We would then have both a mechanical as well as a toxic factor in the causation of this subjective phenomenon known as headache.

Accepting this as true, what then are its characteristics? Do we have a typical sinus head pain? Broadly speaking, this can be answered in the affirmative, but with reservations. With the ordinary textbook case of sinus disease, running a textbook course, on questioning the patient regarding his headache, he would say; "Yes, doctor, the pain comes on shortly after I arise and continues until 1 or 2 o'clock, then suddenly ceases, and I am comfortable for the balance of the day." That is the typical sinus headache, but where one is typical, a dozen will be quite the opposite, so that unless it happens to be one of the variety adhering strictly to type, as far as periodicity is concerned, little reliance can be placed upon its diagnostic import.

What, then, regarding the character of the pain, referring especially to its degree and type?

The character of the pain may be dull, splitting, semithrobbing, throbbing and combined, the old sick headache of our boyhood days. All these depend upon the pathologic process or condition present in the sinus or sinuses at that particular moment. The presence of any one of these types has its own peculiar reason, and one can accept with reasonable certainty that the severity of the pain is directly as to the congestion in the sinus and sinus mucosa. Thus, if the sickening, throbbing

symptoms prevailed, one can rightly deduce that an acute period of passive congestion or rather an active congestion is at the moment in the process of being, while, should only a dull ache be present, either the acute process has subsided and is in a state of comparative quiescence or the infection is a mild one and has not greatly affected the sinus mucosa. Even this statement, however, cannot be accepted at its apparent face value, but has its limitations, as will be seen when we speak on the frontal sinus.

From the foregoing, it will be seen that in sinuology one endeavors to associate a given type of pain with a recognized pathologic condition within the sinus, and one of the results of this is that certain obscure types of cephalalgia are no longer being recognized; chronic nervous headache, for example, is a term which is now rapidly becoming obsolete.

Another characteristic of the sinus headache is its peculiar intolerance to alcohol and to some extent to tobacco. I have often noted when a patient is fairly comfortable and decides that a hot drink before retiring (which some well wishing friend seems always to be in a position to supply) will benefit his condition, he is invariably made much more uncomfortable. This is, of course, due to the congestion which it causes in the head, adding to the already swollen and inflamed mucosa in its becoming suffused to the point of engorgement.

One more point of importance is the subjective localization of the pain. In a given sinus infection the pain will always recur in the same place, and while that sinus alone is involved it will remain constant. This holds good, even during the acute exacerbations of the inflammation process, the pain, of course, reacting accordingly. If, however, the infection spreads to a neighboring cavity the pain will then assume the characteristics pertaining to the latter as well as continuing in the old locality. This will be further elucidated when treating with the sphenoid.

Regarding the complete absence of pain in attacks of sinusitis that are worthy of the name, I am somewhat of a skeptic. Certain authors (notably continentals) have reported such cases, but I have never met one in my own practice in which either pain or tenderness had not been present. The expe-

riences of my own colleagues seem to bear mine out in this matter. This, of course, refers to infections with suppuration and does not include those mild hyperplastic conditions which often affect the ethmoid.

Let us now apportion the head into areas corresponding to those usually affected by the individual sinuses. This is shown by the accompanying illustration:

The confinement of the pain within these specified areas, as attributed to individual sinuses, is not invariably accurate, but bases itself quite well for purposes of differentiation. For example, headache from frontal sinusitis is usually confined to the supraorbital region, but may, in certain cases, extend well into the parietal area, a region usually dominated by the posterior ethmoid and sphenoid. Again, the typical sphenoid head pain is in the occiput, yet I have seen cases where it was transmitted to a spot directly over the front of the maxillary sinus on that side. By and large, however, we can accept the diagrammatic illustration as fairly illustrative of the typical head pains as caused from the different sinuses.

Let us now consider our subject from the standpoint of the individual sinuses, only chronic infections being considered, as time is lacking, and, roughly speaking, the acute infections, with the possible exception of the sphenoid, are more or less self evident.

#### THE MAXILLARY SINUS.

Paradoxical as it may seem, the typical pain from an inflamed antrum is directly over the frontal sinus on the same side. This may be so severe and persistent as to simulate a frontal infection, and indeed many a frontal sinus has been chiseled open and found to be healthy, on this very account, a circumstance which some time ago occurred in our city. One would expect in a case of sinusitis that no matter where the pain radiated, at least it would be particularly marked over the limits of the sinus cavity and, even if quiescent, could be elicited by means of pressure or tapping. Only very exceptionally does this occur in chronic maxillary sinusitis. Occasionally, during an acute exacerbation, the patient will complain of a feeling of pain in the antrum, but on close questioning it will be found that the sensation is not so much an ache as a feeling

of distention or pressure. Tenderness or even deep pressure is not elicited.

#### THE FRONTAL SINUS.

Chronic inflammation of this cavity always seemed to me to be analogous to chronic appendicitis. The two run almost identical courses, periods of quiescence interspersed with acute exacerbations, no one ever knowing just when a flare up will occur and how serious it will be. Usually headache associated with this in the stage of quiescence depends considerably upon the size and extent of the sinus, but presuming the cavity of normal area and the infection not particularly virulent, the pain is of a dull character, not quite sufficient to keep the patient confined to the house but enough to seriously interfere with his business pursuits, particularly brain work, such as an accountant or bookkeeper. He will say, "Doctor, this headache annoys me so I can't keep my mind on my work." In other words, he has lost the ability to keep the attention concentrated. The pain usually remits some time during the afternoon, often completely, but in bad cases seldom entirely. When an acute exacerbation occurs the headache augments corresponding to the swelling and consequent pressure that obtains within the sinus cavity. This is when we have those pains which are of a splitting or throbbing character, in which the reaction of the patient is one of intense suffering. The Austrians have an expression for these: "Wahnsinnige Schmerzen," which is difficult to translate into idiomatic English, but I think describes them better than any other definition with which I am familiar. Indeed, they may become so unbearable as to awaken in our weaker brethren suicidal tendencies. As the acuteness subsides the pain also recedes, until it reaches its lowest ebb, a degree of more or less relative comfort, which in that particular case may be considered normal.

Curious as it may seem, the pain may not necessarily be proportionately severe as to the duration of the disease. In other words, it does not necessarily follow: The more chronic the disease, the greater the headache.

I recall particularly a young man who came into the hospital after a peculiarly severe attack of acute frontal sinusitis from deep diving. He presented himself for diagnostic purposes,

feeling much improved over his condition of the previous week and rather resented the idea of an operative procedure, but at the time of operation at least half of the frontal lobe was covered by an extradural abscess.

It is interesting to note that even beginning cerebral complications need not necessarily be accompanied with severe local manifestations, particularly when the silent area of the brain is involved.

#### THE ETHMOID.

This structure is unlike the true sinuses, which represent cavities situated outside of the nasal fossa, while the ethmoid labyrinth is a mass of cells of a spongy consistency, lying within the nasal chambers. Under these circumstances we can rightly suppose that head pains from disease of this structure would be of a different character than those from the true sinuses, surrounded by hard, unyielding bony walls. The ethmoid labyrinth is subject to two distinct forms of infection: Chronic hyperplastic with polyp formation and chronic suppurative. In both of these forms of the disease, headache is one of the most inconstant symptoms, the violence of the pain having apparently no relation to the severity of the disease. In certain cases the pain will be quite severe, yet the actual pathologic changes are insignificant; in others, the headache is mild, yet enormous tissue changes have taken place within the sinus. While a special treatise on the various ethmoid headaches would require the two forms to be dissociated, however, in this instance, lest we become too involved, it might be wise to consider them both under one heading. As noted in the diagram, headache from ethmoid inflammation is felt particularly over the parietal regions. A dull pressure would perhaps describe it better than an actual pain. This, of course, varies at even different hours through the day and, when severe, sometimes extends into the temporal regions. In severe cases, even after the pain leaves, the scalp remains sensitive to pressure. As the infection is apt to be more advanced on one side of the ethmoid capsule, the pain will naturally be more pronounced on that side. Regarding a differentiation between the pain in the polypoid and suppurative varieties there is little to choose. Broadly speaking, however, one can say that in the

hyperplastic type it is more constant, while in the suppurative, it is apt to be much more severe.

Another point of distress in ethmoid infections is between the eyes directly above the root of the nose. The patient says there is a feeling as though a wedge was prying things apart, and if he could only get his finger in there he could pull it out. In other words, patients can localize the seat of their pain within very small limits. This is by no means constant, but when present is pathognomonic.

#### THE SPHENOID SINUS.

Pain from this, the deepest lying sinus cavity in the cranium, is perhaps one of the most overlooked and yet most significant of all those head pains with which we are concerned. The headache usually associated with sphenoiditis of the chronic type is perhaps more typical than any of the others, possibly excepting the frontal. It consists of a diffuse feeling of pressure in the occiput, sometimes extending into the mastoid processes and even into the temporal region. Extension downward into the shoulder, of the affected side, the so-called sphenopalatine syndrome, popularized by Sluder, is also commonly associated with this affection.

The degree and extent of the pain is concomitant with the amount of pressure within the sinus. As this pressure, except in extreme instances, is not constant, it naturally follows that the headache must occur in periodical attacks, the severity of which is dependent upon the degree and prolongation of the secretory pressure. This may be caused, on the one hand, by the contained and continually forming secretion, and on the other by the approximation of the sides of the inflamed mucosa. Both of these forms may be exerted coincidently. As the pressure is relieved, the pain remits in intensity, the remission being directly as to the length of time required for the passing of the congestion. During paroxysms or stage of retention the cephalgia changes its character to an intense sickening and throbbing synchronous with the heart beat, while during the stage of quiescence it assumes more the character of a heavy pressure upon the vertex. The periodicity of recurrence is not typical as in the frontal, but seems to come on at any

time of the day and does not remit with that abruptness as is so often noted with the latter.

Another curious phase of the pain is its occasional appearance directly below the eye, in the region of the infraorbital nerve.

Dizziness, especially on stooping, is more frequently associated with pain from the sphenoid than from any of the others, and when marked is rather indicative of inflammatory disturbances within this cavity.

And now, gentlemen, I am done. In conclusion, however, it would seem that headache is one of the most common of all the symptoms associated with a chronic sinusitis, and that the time, place and degree of these head pains, properly interpreted, despite their vagaries, constitute one of the most reliable signs in the symptomatic diagnosis pertaining to sinuology.

LXXVII.

EAR POLYPI IN ACUTE OTITIS MEDIA.

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Ear polypi are ordinarily defined as connective tissue growths of inflammatory origin which develop during the course of a chronic suppurative otitis media.

A few textbooks also stated that less frequently, or rarely, they may be found in the acute forms of this disease, but no case reports were found.

Having seen two cases of acute otitis media in which round cell polypi were present, within the interval of a few days, it caused the author to search through the literature at his disposal for some enlightenment on this subject. This resulted in little to reward his efforts.

The paper, therefore, is presented to you, not with the idea of imparting something new, but rather with the opposite idea of bringing out in the discussion the reason for the infrequency of polypi in acute otitis, their prognostic value, etc., also the author will shortly review the entire subject of ear polypi. We may divide ear polypi into:

1. Granulations or round cell polypi, or mucous membrane polypi.
2. Fibromata.
3. Myxomata.
4. Transitional forms.

The following are examples of rare cases reported in the literature:

1. Polypi in the middle ear in a case of nonperforating otitis.<sup>1</sup>
2. Congenital polypi.<sup>1</sup>
3. A fibroma like polyp with central cholesteatoma without any suppuration in the ear.<sup>2</sup>

No. 1.—The granulations consist of a hyalin homogeneous stroma traversed by a more or less fibrous framework, in which

scattered or closely packed round cells, and sometimes also a few spindle cells, are embedded. By metamorphosis of the round cells into spindle cells the soft polypi may obtain a hard fibrous character. The surface of these growths is rarely smooth, having deep glandlike indentations. They are covered with epithelium which shows all the transitional stages from simple ciliated to pavement. There may be several different forms on the same polyp.

No. 2.—The true fibromata have a long fine fibrillar stroma, in which spindle cells are often interspersed. They are not as rich in blood vessels as the granulations. Their surfaces are smooth and covered with stratified squamous epithelium.

No. 3.—The myxomata differ from the fibromata in that their stroma is composed of myxomatous tissue.

Statistics: Statistics as to the relative frequency of these tumors are fairly constant: Bruhl<sup>3</sup> in 60 cases found that 47 were mucous membrane polypi, 8 fibromata, 5 myxomata.

There is, as you know, some question as to whether these different forms of polypi originate as such, or whether they are merely transformations from mucous membrane polypi.

Citelli,<sup>4</sup> who is one of the strongest advocates of the latter theory, has shown by numerous histologic investigations that most of the fibromata or myxomata have granulomatous bases. This, I think, is conceded by most pathologists. The granulomatous tissue diminishes towards the extremity of the polyp. He has also shown peripheral areas of granulation tissue in fibromata and myxomata.

He holds that the fairly constant presence of this granulation tissue has an important bearing on the pathogenesis of these tumors; further, he thinks that the point where the tumor is inserted probably began with a pathologic lesion of the wall, by means of granulation tissue. That portion of the tumor in contact with the lesion remains granulomatous on account of the irritation produced by the diseased focus. The more distal portions gradually begin to undergo fibromatous transformation.

Most authorities seem to agree that ear polypi are produced by a severe and prolonged productive inflammation of the

connective tissue of the parts involved. The earliest stages of their growth can only be recognized by microscopic examination. A granulation tissue development begins in the submucosa, either breaking through the epithelium and presenting devoid of this covering, or by pushing ahead a portion of the epithelium they are then found as small tumor masses.

Most polypi spring from the middle ear, particularly the labyrinth wall.

Moss and Steinbrügge<sup>5</sup> found that in 100 cases of ear polypi 75 originated there, the remainder in the outer canal. They may, however, arise from the ossicles, the edges of a perforation in the drum, and also in the eustachian tube. Those arising in the external auditory canal spring from the posterior superior portion of the canal wall.

**Etiology.**—Polypi are usually caused by a chronic otitis media. They are rarely found in acute otitis. Occasionally the pressure of a foreign body or cerumen may be the etiologic factor.<sup>1</sup>

Relative to the occurrence of round cell polypi in acute otitis, I was only able to find the following quotations:

Alexander<sup>6</sup> states that a particularly unfortunate symptom of infantile otitis is the presence of abundant granulations of the middle ear and of the perforated margin of the tympanic membrane, which may occur at an early period, causing a retention of pus.

Kopetsky<sup>7</sup> quotes Swartz as having seen granulations from the margin of a paracentesis wound.

**Diagnosis:** Diagnosis is generally easy, especially if a probe is used.

An abscess of the canal wall or an exostosis may be puzzling, if inspection alone is the basis for diagnosis. Granulations springing from a large furuncle or the papillary excrescences of a carcinoma may be more difficult. Chronic myringitis villosa may merely be mentioned.

**Treatment:** Whenever polyps are demonstrable they should be eradicated, as they usually increase in size, thereby blocking drainage. This, in turn, may be followed by an increase in the existing pathology, which may result in the dreaded complications of chronic otitis or mastoiditis.

The external auditory canal should be thoroughly cleansed of all secretions by some antiseptic, like bichlorid of mercury.

Anesthesia: In adults I use the triple anesthetic—equal parts of cocaine, menthol and phenol; in children, gas or ether is better.

Most authors advise the use of a snare in removing large polypi. If the snare is used great care should be taken that no traction is made after pulling the loop down over the pedicle. Even under these circumstances complications may arise. In one personal instance a facial paralysis resulted.

Where the polypi are small some form of caustics is usually employed, preferably chromic acid fused on a probe. Here, again, great care should be exercised to neutralize its action. In a case with granulations in the middle ear the author saw an acute labyrinthitis develop after applying trichloroacetic acid, which he thought he had properly neutralized. The author usually relies on a punch forceps, followed by lactic acid, even in those cases which present large polypi.

#### CASE REPORTS.

Case No. 1.—Carl F., aged 5. This case was first seen on February 2, 1924, in consultation with the child's otologist. The following history was obtained:

The child was first seen by the doctor eight days before the above date, on account of earache. There was hyperemia but no bulging of the drum. The parents were told to return daily with the child, but neglected to do this. About three days later they brought the child back and at this time the drum was bulging. A paracentesis was performed and the child did not return to the physician for 48 hours, at which time he discovered a large polyp in the external auditory canal. The secretion was scant and mucopurulent. He noticed on his daily visits that the child was becoming more toxic and therefore asked me to see the patient with him the following morning, February 2, 1924.

Upon examination, I found scant secretion, stringy and mucopurulent in type. The drum was invisible on account of a large polyp, which entirely obstructed the view of the drum

membrane. There was no apparent dropping of the posterior superior canal wall, no mastoid edema or tenderness. His temperature was 101 F. There was considerable rigidity of the neck and a partial Kernig. Some photophobia was also present.

A mastoid X-ray was ordered, which revealed a cloudiness of all mastoid cells on the affected side. Leucocyte count was 17,000.

A neurologist was called into consultation, who agreed that we were dealing with a beginning meningitis.

A mastoid operation was advised, but the parents were opposed to an operation, so a compromise was made to remove the granulation tissue for better drainage, and, if no relief was obtained, to do the mastoid operation later. This the writer carried out the same night. The polyp was partially removed with a punch. It was impossible to be certain from where it arose, because of its broad base. We decided, however, that it was from the edges of the paracentesis wound.

No improvement was obtained by this procedure, and a simple mastoid operation was performed twenty-four hours later. All the cells were filled with granulation tissue, with considerable destruction of the intercellular septa. Very little pus was present. The dura and sinus were not exposed.

There seemed to be some improvement of his general condition for a few days, but he gradually grew worse and died on February 11, 1924, this being seventeen days after he was first seen by his physician.

During his illness his leucocyte count was as high as 29,000. Blood cultures were repeatedly negative. His temperature, which was 101 F. when I first saw him, rose to 105 F. by rectum after the mastoid operation, and never dropped below 102 F., and finally reached 106.2 F. just before death.

There was no doubt in the writer's mind that the meningitis was of metastatic origin and not by extension from the mastoid.

Case No. 2.—Nancy H., aged 6. The writer was called in to see this child February 3, 1924, one day after seeing the preceding case. She was suffering severely with an earache, which had been present for about eight hours, and which was

the first attack of ear trouble she had ever experienced. There was considerable bulging of the left drum, and an immediate paracentesis was performed. There was profuse discharge, mucopurulent in character, the streptococcus mucosus being found in the smear made from the discharge. Thirty-six hours later a polyp began to develop which covered the entire drum within 48 hours.

In the meantime she developed an acute otitis in the right ear, and on February 6th she was taken to the hospital and a paracentesis was performed on the right ear and the granulation tissue was partially removed from the left ear. Within forty-eight hours the canal of the right ear was also filled with granulation tissue. There was also a prompt return of polypoid tissue in the left ear.

Instead of again attempting to remove the polypi by surgical methods, applications of lactic acid were used, which seemed to check their growth and promote drainage. The secretion remained mucopurulent throughout the entire course of the disease, which lasted for twenty-four days. Granulations remained in both ears until the last six days of her illness.

The child was quite toxic and carried a temperature throughout the entire illness, the morning temperature averaging 100 F. and reaching 101 to 102 F. in the evening.

Leucocyte counts averaged about 13,000.

A mastoid X-ray taken on the tenth day of her illness showed no involvement of her mastoid cells.

The ears both stopped discharging and the drums healed completely.

One month later the child developed another attack of acute otitis in the left ear, at which time a paracentesis was performed, and although the same microorganisms were found, no granulations appeared and the ear stopped draining within eight days.

#### SUMMARY.

The reason for the infrequency of polypi in acute otitis media is no doubt due to the fact that a prolonged inflammation is essential to produce the stimulation necessary for their growth.

My experience with the condition is not sufficient to allow me to form any opinion as to their prognostic value, but would indicate, however, that the removal of these polypi by surgical methods is not successful.

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## LXXVIII.

### CHEMOTHERAPY IN OTITIS MEDIA.

BY ELLIS M. SCHWARTZ, M. D.,

NEW YORK.

Before touching upon the main substance of the article, it is advisable to call attention to the etiologic factors in otitis media. The middle ear is connected with the outer surface of the body by the eustachian tubes, which have their openings into the nasopharynx. The eustachian tube has two important functions:

1. That of ventilation and condensation of atmospheric pressure.

2. Drainage of the middle ear cavities.

The mode of entrance of pathogenic bacteria into the middle ear or tympanic cavity is:

1. Mainly through the eustachian orifices under pressure caused by blowing the nose, coughing or sneezing.

2. From the external auditory canal, from a perforated or traumatized drum.

3. Through the blood and lymph channels, as in miliary tuberculosis, and

4. From fractures of the temporal bone involving the temporal cavity or the mastoid process.

#### ORGANISMS FOUND IN CULTURES.

The streptococcus and staphylococcus are the most prevalent organisms in pure cultures from ear discharges. Also, the pneumococcus, diphtheria bacillus, influenza bacillus, bacillus pyocyanus. It is important to note the gram staining properties of these organisms, which are as follows:

	Gram.
Streptococcus .....	+
Staphylococcus .....	+
Pneumococcus .....	+

	Gram.
Diphtheria bacillus.....	+
Influenza bacillus .....	—
Bacillus pyocyanus.....	—
Tubercle bacillus.....	+

The occurrence of the otitis media is largely influenced by the season of the year, the age of the patient and the existing disease. Otitis media is more common in the colder months and is also more severe then. The younger child is more susceptible to this disease than the adult, those between three and fifteen months being most susceptible. The most common diseases associated with otitis media are pneumonia, pharyngeal, laryngeal or nasal diphtheria, the exanthemata, as scarlet fever and measles, pertussis, pyelitis, tuberculosis; disturbances in diet, as rickets and acute intestinal indigestion.

The method of irrigating ears with bichlorid solution, boric acid, normal saline, sodium bicarbonate or weak lysol solution has been employed with more or less success. The duration of otitis media where these methods are employed has varied considerably from weeks to months, many cases of acute otitis media becoming chronic, the discharge persisting for years and complicated by a foul odor.

Dr. David Smith of Johns Hopkins Hospital and Rockefeller Institute and Miss Justina H. Hill, bacteriologist, have recently made numerous tests of the bactericidal action of several synthetic drugs and dyes. The cultures used were made from purulent otitis media cases. The drugs employed were: Acid fuchsin, meroxyl, neutral acriflavin, gentian violet, mercuric chlorid, mercurochrome.

It was found that meroxyl or sodium hydroxy-mercuri-benzophenone sulphonate acts mainly on gram negative organisms and that gentian violet acts on gram positive organisms, and it was also found that these drugs could not be mixed, because gentian violet was precipitated by the mercury of the meroxyl. The pyocyanus resisted both of these drugs. Acetic acid was then employed with remarkable results. It worked almost like a specific in pyocyanus cases, and it was also found that acetic acid could be combined with the sodium solution.

Churchman, in 1923, has shown that neutral acriflavin and gentian violet may be mixed and that the mixture is more bactericidal for streptococci than gentian violet alone.

The method employed in the application of these dyes is mostly mechanical. A free incision in the drum or tympanum is very essential, so that the drugs can act directly on the middle ear or mucous membrane of the eustachian tube, and thus work on the organisms causing the otitis media. In order to obtain a clear field, some irrigation is first necessary. Hydrogen peroxid half strength is employed. The oxygen liberated loosens the pus and serves as an indicator of the presence of free pus. By the aid of a medicine dropper the ear is flushed several times, or until the peroxid stops frothing. Then the fluid is sucked out until the ear is dry. Objection has been raised to the use of peroxid on the ground that the oxygen liberated in the middle ear may force organisms into the mastoid, but I believe this to be groundless, because no such thing has occurred in my cases, and Boxer has reported its use in 190 cases without any mastoid complications.

At first a culture and smear were taken from the pus in the ear to determine whether the organisms were gram positive or negative. After irrigation with hydrogen peroxid, the ear having been dried, the sodium solution or violet was dropped into the ear, depending on whether the gram positive or negative organisms predominated. In conjunction with Dr. Smith, we employed this method at the Israel Orphan Asylum with great success and with the same success later at my office. In order to simplify the method, so as to avoid the necessity of making smears and culturing the ear discharge, which is sometimes found impracticable, I decided upon the following changes, so that I proceed without determining the type of organism or organisms present by culture or smear: After the external auditory canal and middle ear are thoroughly cleaned with the peroxid, a half medicine dropper of the merroxyl and acetic acid solution is introduced into the external auditory canal. This solution is washed back and forth, in order to force the solution into the middle ear, so that it may act directly on the organisms. Thus the drug acting on the gram negative organisms and the drug acting on the

pyocyaneus have been employed. The ear is again dried by suction and by means of cotton applicators. A few drops of the gentian violet and neutral acriflavin combination are then instilled into the ear and a piece of cotton placed in the external auditory canal to prevent overflow. This is left undisturbed until the next treatment. You have now employed the drug acting mainly on the gram positive organisms.

#### RESULTS.

The results obtained from this method of chemotherapy have been very good; especially remarkable were the cures obtained in chronic otitis media of months' standing, with a foul odor and a thick pussy discharge—such cases as have been lying on the hands of the otologist for so long a time as to discourage both him and the patient. After two or three treatments the first thing that the patient noticed is the disappearance of the offensive odor, with a gradual diminution of the discharge and drying up of the ear. Of special interest to the patient is the order to diminish the frequency and soon to stop all ear irrigations. The patient has absolutely nothing to do but wait and report for the next treatment. A point to be emphasized here, as in the acute cases, is the importance of a free and wide opening in the drum in order to permit the drugs or dyes to act directly on the organisms in the middle ear. Hence, before commencing the treatment of a chronic otitis media I re-incise the drum and enlarge the opening if necessary. If the ear is watched closely, the meroxyl being somewhat irritating, one can notice as the pus diminishes a slight redness around the edges of the drum opening and evidences of new granulations which gradually fill in the gap and seal the drum.

In the acute cases the results are also good. After one or two treatments the pain and temperature are lowered in many cases, and the patient feels much more comfortable. Several cases which I had under observation, with very marked pain and tenderness over the mastoid process, which with the irrigation method have become acute mastoiditis, with this treatment they have cleared up without such complications.

The advantages of this treatment can readily be noticed. First of all, the ease of application. The doing away with irrigation is the one thing which appeals to the parents most. It

does away with the spilling of the solution, the resistance and fight offered by the child, and it gives the patient an opportunity to rest. The more certainty of the method, the greater number of cures and the shortening of the period of the disease are matters which cannot be overlooked. There is also a less tendency to mastoid involvement.

Just as there are advantages in every method employed, there are also disadvantages. One disadvantage I have noticed is the staining produced by the gentian violet. Should it stain the face or hands it can readily be washed with alcohol, as gentian violet is soluble in alcohol. Again, the staining of the drum may interfere with the field under observation and somewhat change the contour of the drum. Where one has had considerable experience in looking into ears and recognizing pathology this objection is readily overcome.

#### PREPARATION.

The neutral acriflavin, gentian violet, mercurochrome, brilliant green are all made up in 20 per cent alcohol, and are used in 1 per cent strength. The meroxyl is used in one-half of 1 per cent strength, and is made up entirely as a watery solution.

In concluding, I wish to say a few words regarding the use of mercurochrome. Its action and results were the same as meroxyl, but meroxyl is given preference in use because of its nonstaining properties. Brilliant green, a dye which as yet has not been employed to a great degree, has been found to be of good use in combating streptococcal infection. A more recent drug employed is one called acrivolet—a combination of acriflavin and gentian violet, which is nothing more than a combination of the two drugs I employ.

#### CONCLUSIONS.

The drugs employed and the method of procedure are recommended for the following reasons:

1. They do away with irrigations at home.
2. They shorten the duration of the ear discharges.
3. Mastoid complications are less frequent.
4. After the employment of this method for some time, one is convinced more by the certainty of the results obtained than with other methods.

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## LXXIX.

### ABSCESS OF GASSERIAN GANGLION COMPLICATING MASTOIDECTOMY FOR ACUTE SUPPURATIVE MASTOIDITIS—DEATH—AUTOPSY.

BY CARROLL SMITH, M. D.,

SPOKANE.

A case of sensory paralysis of the face, followed by death, after a simple mastoidectomy, attracted my attention to this rather unusual complication, but most of the articles dealing with this subject dwell more on abducens paralysis as the commoner complication, gasserian ganglion involvement being less rarely mentioned and very frequently only hinted at.

#### CASE REPORT.

F. B., male, age 23.—Previous history: One and one-half years ago suffered from an acute suppurative otitis media on right side lasting two months; he also had a similar attack six months ago, of two weeks' duration.

Present attack: On January 3, 1921, the right ear commenced to discharge through a pinhead size opening in lower portion of drum; this cleared up in a few days, but commenced again on January 18th. The discharge was of mucopurulent character. On January 27th, I removed the tonsils, which were very large and chronically diseased. Tonsillectomy did not have the hoped for result, and the mucopurulent discharge persisted. On February 7th he commenced to have considerable pain in the ear, especially at night, with swelling in front and above the ear; the temperature also went up to 100.6, which was the first time he had had fever. Ice applications and absolute rest for 48 hours produced no results. There was no pain or tenderness over the mastoid, but the swelling in front of the ear increased, temperature varied from normal to  $100\frac{1}{2}$ , and on February 11th I removed him to the hospital. X-ray showed involvement of the mastoid; urinalysis was negative; white blood count 16,000.

On February 12th I did a simple mastoidectomy. While applying the self retaining retractors pus squirted from the swelling in front and above the ear, through the soft tissues, for a distance of four or five feet. There was only a small amount of pus in the mastoid cells and the bone was not necrosed. The bone over the lateral sinus and under the middle fossa was normal, and neither the sinus nor dura was exposed at operation. The operation was not carried far forward, as there was no evidence of disease along the zygomatic process.

The next morning the temperature was 100 and went to 103 by noon. There was some coughing and a few râles were discovered posteriorly on the right side. An internist was called, the lung condition was pronounced to be more of the hypostatic congestion type. Urinalysis next day showed blood, albumin, granular casts and some pus. The temperature gradually went down, and on February 17th, five days after the operation, it was normal all day and up only slightly next day, when the condition looked satisfactory.

On February 19th, the temperature again went up to 104; there was still some cough, and the kidney condition was only slightly improved. The amount of urine in 24 hours was never below 39 ounces and went up as high as 80 ounces. From that date, February 19th, to February 28th, the condition varied greatly. His temperature would be normal for one or two days and then shoot up to 104 or 105, the pulse remaining around 80 and respirations around 24. He would have some severe sweats following the fever but never had a chill; he did, however, complain occasionally of a slight chilly sensation. He had no pain and felt well, no headache but an occasional throbbing pain around the eyes. Fundus examinations were always negative. He had no pain or tenderness on right side of neck and had no meningeal or nervous symptoms. There was still considerable cough, but no tubercle bacilli were found in sputum. The blood cultures were negative. He had, however, lost considerable weight.

The suppuration from the ear had practically stopped, and there was very little from the wound. The pus from the ear

and wound showed staphylococci and a few streptococci. Leucocyte counts varied from 13,000 to 16,000.

On February 28th, under local anesthesia, I reopened the wound and uncovered the sinus. It appeared perfectly normal, but to be absolutely sure I aspirated blood from it. A culture of this blood proved to be negative.

He improved for a couple of days, then on March 2d the temperature jumped to 105.6, pulse remaining around 80. The temperature varied from around 100 to 104½ for the next four days. On the night of March 6th he complained of a numbness of the right cheek, and next morning we discovered an almost complete sensory paralysis of right side of face. He was very restless during the night of the 7th and complained of some pain in left leg and hip. Next day a spinal puncture was made, and the white cells were markedly increased, polynuclear leucocytes 90 per cent, but no bacteria were found. White blood count, 18,000. There was no choked disc. On the 9th he became irrational, developed rigidity of the neck, a positive Kernig and slight Babinski. He became unconscious at midnight of the 10th, developed a partial paralysis of the left arm and leg at 4 a. m. and died at 8 that morning.

An autopsy of the head was made. The brain was removed without much difficulty. It was moderately edematous and a slightly increased amount of faintly turbid fluid escaped. There was a seropurulent exudate under the arachnoid in the fissure between the pons and the medulla in the cerebellopontine angle on both sides, more on the right than on the left, in the medium sulcus of the pons and on either side of it, around both crura cerebri, and around the corpora mamillaria; thence extending forward to the lateral fissure, and about two centimeters to either side of it as far as the postcentral sulcus on the left side, and up as far as the parietal lobe on the right side. There was considerable exudate around the optic chiasma, but it did not extend into the longitudinal fissure. There was patchy exudate on the under surface of both temporal lobes, more or less in continuity with that about the brain stem.

A horizontal section of the brain revealed no abscess in the upper brain tissue, nor was there any in the temporal lobes. Lateral ventricles contained the usual amount of fluid, slightly turbid. The fourth ventricle and aqueduct of Sylvius were normal. Cerebellar hemispheres and vermis were normal. Base of the skull presented nothing unusual anywhere, nor was there any evidence of localized inflammation about the operated mastoid area. The lateral, inferior and superior petrosal sinuses were free from thrombosis.

A white elevated area the size of a half dollar was seen over the right gasserian ganglion. An effort was made to dissect out the same, but when the ganglion was exposed, about two cubic centimeters of thick, very yellow creamy pus escaped from and around it. The petrous portion of the temporal bone was removed, and a close examination failed to find any disease of it or any sinus leading from the middle ear toward the ganglion. The left gasserian ganglion was normal.

#### REVIEW OF LITERATURE.

Morris of London was one of the first to write on the subject. He reported some cases of herpes zoster of the face, supplied by branches of the third division of the fifth nerve, and along the auriculotemporal in cases of mastoiditis. He mentioned venous congestion as being the etiologic factor.

Politzer mentioned in the fifth edition of his book a case reported by Spira in 1895 in which an osteitis developed in the center of the mastoid with symptoms of severe trigeminal neuralgia.

In 1916, Dr. Dench reported a case which partially resembles mine: Young woman, 17 years. Acute otitis following gripe; seen on eighth day after inception of middle ear inflammation. On examination, temperature 104; mastoid extremely painful. Immediate operation revealed mastoid cells filled with blood and some free pus; dura appeared healthy. Zygomatic cells thoroughly eradicated. Blood cultures negative. Temperature normal, four days later. Left hospital ten days after operation; was weak and not feeling very well, but no pain. Two and one-half weeks after operation patient began to have head-

aches (frontal and temporal). Shortly after came to his office; temperature 104, pulse 142. Sent to hospital. Blood negative. Improved and left hospital in about a week, with little pain and wound O. K. One month and three days following the operation patient commenced to suffer severe frontal headaches, and the region over the first branch of the trigeminal nerve was excessively tender to pressure. No ataxia; no nystagmus; fair hearing; normal temperature and pulse; extremely nervous. The symptoms continued with increasing severity for about 12 days. Abducens paralysis during this time; lost flesh; condition very unsatisfactory, but temperature and pulse normal.

Six weeks after operation patient again entered hospital on account of her headaches and nervous symptoms. Abducens paralysis complete, but no other evidence of any intracranial involvement. Dench could only explain the pain by assuming that there had been an inflammatory process extending along the dura from the area of original exposure inward to the gasserian ganglion and that this inflammatory process accounted for the pain and abducens paralysis.

The wound was reopened and the incision extended forward to a point one inch beyond the margin of the orbit. Dura of middle cranial fossa exposed entirely, and floor of fossa explored, including roof of petrous pyramid. No pus; dura appeared normal. Absolutely no pus was found in either the mastoid wound or the middle cranial fossa. A folded rubber tissue drain was introduced to the apex of the petrous pyramid. From this time the patient improved and ultimately made a complete recovery. On the second or third day after operation she developed beginning choked discs in both eyes, but the optic neuritis began to disappear on withdrawal of rubber drain from the middle fossa.

In this case the pain seemed to be due simply to a low grade inflammation of the dura extending inward and involving the gasserian ganglion. The case is particularly interesting as bearing upon trigeminal neuralgia in cases of middle ear suppuration.

Dr. Perkins of New York, in 1910, reported six cases of abducens paralysis and suppurative otitis media.

In explanation, he shows how the gasserian ganglion may be involved.

The sixth nerve passes through the abducens canal. In passing forward it has relations with (first) the inferior petrosal sinus, then it passes beneath an osteofibrous bridge and gains the posterior end of the cavernous sinus. Here it has the superior petrosal sinus above and the gasserian ganglion externally separated only by the sinus wall.

Of two cases in the literature where the cause of abducens paralysis was sinus thrombosis, the author says that simple lateral sinus thrombosis could not produce abducens paralysis *per se*, but only when the thrombosis had extended to the inferior or superior petrosal or cavernous sinuses.

Extradural abscess in the middle fossa was found in two cases of otitic meningitis with abducens paralysis. Such a lesion in passing to the sixth nerve would encounter the gasserian ganglion and produce symptoms. This occurred in one of Wiener's cases, where, in addition to the intense cephalgia which may reasonably have been supposed to have been due to some interference with the gasserian ganglion, there was also an eruption of herpes in the auricular region, the exact significance of which is still under discussion.

Intense headache, especially in the frontal region, severe pain in the eye or deep in the orbit, neuralgia of the fifth nerve or paralysis of some of the muscles supplied by it, are symptoms one or more of which have been noted in 55 cases of abducens paralysis with purulent otitis collected by Dr. Perkins.

This means that there is some interference with the gasserian ganglion by the process going on at the apex of the petrous portion of the temporal bone. Pressure upon the gasserian ganglion has been relieved by increased drainage through operative measures on the mastoid and middle ear. The most conservative way to secure drainage would be

through the mastoid in preference to repeated myringotomies. It has been shown that the region of the petrous apex is not beyond surgical interference.

Later he mentions four cases of retropharyngeal abscess in 94 cases reported of sixth nerve involvement in purulent otitis media, and says: "It demonstrates positively that the suppurative process has invaded the petrous tip and broken through the lower surface of the bone, its approach to the upper surface being shown by involvement of the soft structures, namely, the gasserian ganglion producing neuralgia and the sixth nerve resulting in disturbance of function of the ocular external rectus. The gasserian ganglion lies in much closer relation to a cell occupying the petrous tip than does the sixth nerve. In infective processes extending to such cells we would expect the ganglion to become involved sooner and more frequently than the sixth nerve. It undoubtedly does become involved sooner, and that the sixth nerve does not escape oftener is due to the fact that as it passes over the petrous portion it is encased in a more or less unyielding canal (Dorello's canal), swelling of the walls of which result in pressure and disturbance of function. Notwithstanding this anatomic arrangement, which makes the nerve more vulnerable, there may be disturbance of the gasserian ganglion, evidenced by severe neuralgia, without there being abducens paralysis. Therefore, trigeminal neuralgia, otherwise unaccounted for, occurring on the side of the suppurative ear process should direct attention to the probability that the infection has extended internally to the labyrinth.

Dr. Wheeler describes the Gradenigo syndrome and reports several cases; one in an acute suppurative mastoiditis—child, 11 years—which cleared up quickly after mastoidectomy; another in an acute catarrhal otitis media, clearing up without even a myringotomy.

He also reported a case occurring in connection with a furunculosis of the external auditory meatus, the middle ear not being involved, which cleared up with the recovery of the furunculosis.

A case of double abducens paralysis with a one sided mastoiditis, recovery after mastoidectomy, is included in his report.

In the discussion of that paper, Dr. H. H. Stark of El Paso, Texas, reported a case of the Gradenigo syndrome in a case of acute suppurative otitis media, which cleared up without operative procedure. He thought the paralysis in that case was due to toxemia.

Dr. Gruening of New York reported some cases of trigeminal herpes zoster in connection with mastoid disease, as follows: Man, 41 years old. Left mastoid disease and herpes zoster in the course of the first branch of the left fifth nerve.

Examination of this patient reminded the author of two similar cases he had seen. (1) An old lady suffering from mastoid disease and herpes zoster in the course of the second branch of the fifth nerve; and (2) a middle aged man with the same clinical picture.

A neurologist was consulted in this case, who said that herpes of the fifth nerve was not a harbinger of meningitis. The patient, however, died of that complication.

Friedenwald and Breitstein quote many authorities in their excellent article on "Unusual Forms of Extension of Purulent Otitis Media, with Special Reference to Involvement of Cranial Nerves," and refer to two cases, the first being a protracted case and having (1) paralysis of the left palatine arch, (2) paralysis of the left side of the tongue, and (3) paralysis of the left vocal cord and arytenoid. In this case there was a post-pharyngeal abscess which, through its pressure on the glossopharyngeal, vagus, accessory and hypoglossal, accounted for these lesions.

The second case of abducens paralysis followed a simple mastoidectomy. He gives five etiologic factors for abducens paralysis cases, as follows:

1. Osteitis of the tip of the petrous process (spreading of a purulent infection of the antrum to the tip of the petrous bone, by way of the peritubal pneumatic space and the carotid canal).

2. Circumscribed meningitis about the tip of the petrous bone.
3. Diffuse meningitis.
4. Toxic or inflammatory neuritis.
5. Compression.

The first two mentioned causes have been the most generally accepted in explaining these Gradenigo syndrome cases. They believe, however, that spontaneous recovery of many of these cases argues against the osseous involvement of the petrous tip and are inclined to credit the toxic neuritis due to pent up pus as being the most common etiologic factor.

Stickney reports two cases of abducens paralysis occurring in acute suppurative mastoiditis.

His first case he attributes to a toxic neuritis, which cleared up shortly after mastoidectomy. The second case, he says, was due to a localized basilar pachymeningitis. There was no improvement in this second case two weeks after the mastoidectomy, so a second operation was then done. At this operation the tegmen of the mastoid was removed as far forward as possible, the dura found congested and adherent, and on separation considerable plastic exudate was found. An iodoform gauze drain was placed under the dura, along the anterior surface of the petrous portion of the temporal bone, nearly to its apex.

Improvement of the general and local ear conditions followed, and within ten days the abducens paralysis commenced to clear up. He advocates an exposure of the dura in all cases of abducens involvement.

Coughlin reports a case of Dr. H. W. Lyman's, of sensory paralysis of the right side of the face, occurring 60 hours after a right radical mastoidectomy, also a motor paralysis of the same side of the face, coming on 72 hours after the operation. The fifth nerve paralysis cleared up in eleven days, the seventh lasting several weeks but clearing completely. No cause was found, blood examinations were negative and there was no rise of temperature indicating further infection.

Lyons, in his paper on "Otitis Media Complicating Operations on the Gasserian Ganglion," reports four cases, two occurring within three days, one on the ninth and the other several weeks after section of the posterior root of the gasserian ganglion for trifacial neuralgia. He explains very clearly the abundant nerve connections between the gasserian ganglion and the mucous membrane of the middle ear and attributes the disturbance to trophic changes. Corneal ulcer, on the same side, of course, occurred in two of these cases, which he likewise attributes to trophic changes. He also mentions the fact that these conditions sometimes follow alcohol injections of the posterior root of the ganglion. His paper clarifies ear complications following gasserian ganglion disturbances, as it is intended to do, but does not help clear up the course of gasserian troubles resulting from ear infections.

#### COMMENT.

Although recovery has occurred in many cases having the Gradenigo syndrome without surgical interference, I believe all cases with even the slightest mastoid symptoms should be operated on and that the operation should uncover the lateral sinus and the dura in the middle fossa. This procedure would, I feel, prevent a second operation in a large percentage of cases. The exposure of the dura and insertion of a rubber drain, according to the practice of Dench, seems to me a very proper procedure. Choked disc as an indicative sign for surgical interference is of little and questionable value. It is present in only a small portion of cases and occurs too late to be of value.

Perkins' explanation of the mode of extension by way of the pneumatic cells to the petrous tip seems to be the most logical one, although in my own case there was no evidence of infection of these cells, and undoubtedly some cases result from infection along other routes. There is no reason why some cases of abducens paralysis cannot be attributed to toxemia or to focal infection, which might explain the case of double external rectus paralysis with one sided mastoiditis and the case accompanying the furunculosis mentioned by Dr. Wheeler.

The old reflex theory is no longer considered.

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LXXX.

BLACK HAIRY TONGUE (LINGUA NIGRA PILOSA)  
WITH REPORT OF A CASE.

BY CARL H. CHRISTOPH, M. D.,

CHICAGO.

This is a disease of the tongue which is localized in the papillæ circumvallatae and characterized by the development of dark brown hairlike protrusions.

The etiology is at present not quite clear but among the theories which have been presented we find the following:

1. Gastrointestinal disturbances.
2. Long continued irritation of the oral cavity by nicotine.
3. Stomatitis on a medicinal basis. (It is often found in syphilitics who have received a long period of mercurial treatment and have irritated the mucous membrane by the continued use of hyperoxid mouth washes.)
4. Acute intoxications.
5. Acid condition of the saliva.
6. Trophoneurotic disturbances.

Although most authors agree that fungi are not etiologic factors, two organisms have been mentioned as causative agents:

7. a. *Saccharomyces lingua villosæ* (in diabetes).
- b. *Dessois' glossophyton*.

The intensity of the affection as well as of the color Blau<sup>1</sup> believed to be dependent upon the varying potassium sulphocyanid content of the saliva.

Oppenheim<sup>2</sup> differentiates the acquired hairy tongue from a true nevus verrucosus of the pigmented variety on the tongue by the fact that in the latter condition no change is possible. In three cases he has succeeded in artificially producing a black hairy tongue by painting the tongue for fourteen consecutive days with tincture of *rhatany et galli*.

The permanency of the discoloration in the acquired hairy tongue depends on the fact that only those discolorations of skin or mucosa are lasting in which the coloring matter is in the connective tissue or in which the proliferating horny substance has been absorbed. Thus, according to the opinion of Oppenheim, in a false or pseudohairy tongue there is a hyperkeratosis of the papillæ filiformes with absorption, which is due to the horny formation of irritating substances.

Various authors also disagree as to the pathology. Schomp and Schech<sup>3</sup> consider it a true hyperkeratosis, while Oppenheim<sup>4</sup> believes it is a hypertrophy and hyperkeratosis of the papillæ filiformes. In preparations colored with VanGeisen and other stains Blegvad<sup>5</sup> found that the papillæ are first elongated, for some unknown reason, and then colored chemically by food, wine, tobacco or iron, mercury and so forth. Michael Cohn<sup>6</sup> offers as proof of an endogenous etiology the case of a child with hairy tongue which was nursed at the breast.

The disease has a sudden onset, without subjective symptoms, and usually is discovered accidentally by the patient or the physician, the symptoms appearing later in the course of the disorder. A circumscribed, oval coating of dirty brown, black or green appears on the dorsum of the tongue, which upon close inspection is seen to consist of hairlike structures sometimes several centimeters in length, which are continuations of the elongated and thickened papillæ filiformes. This coating, which sometimes is unilateral and sometimes bilateral, usually does not involve the periphery of the tongue. The papillæ may be so elongated that they have the appearance of well developed, somewhat bristly hairs, and have been compared to the wet coat of a longhaired dog. The elongations usually grow forward and if stroked from the back of the tongue forward feel smooth; if stroked in the opposite direction they feel rough.

Zilz<sup>7</sup> has reported a case of *lingua villosa nigra disseminata* in which the coating appeared in islands which were starshaped and scaly. Michael Cohn<sup>8</sup> described the case of a child sixteen months old in whom there appeared, together with the already mentioned black, hairy tongue, a coal black discoloration of the lateral upper incisors. The gums showed no

changes. The author believed the condition was due to pathology of the dental pulp and that it was entirely independent of the tongue condition.

The disease has been found most commonly in males, which first called attention to nicotine as an etiologic factor. In the cases in which the condition was due to the prolonged use of hyperoxid as a mouth wash its discontinuance brought immediate improvement.

My patient was a man, aged 38 years, who gave a history of two attacks of influenza, frequent attacks of tonsillitis, two frontal sinus infections, one attack of bronchopneumonia and a "nervous breakdown." He had had no gastrointestinal disturbances and no gingivitis. The family history was negative.

In January, 1923, following an attack of influenza he took a few doses of a cough mixture which contained codein. Three or four days later he noticed that the tongue was becoming discolored and developing long, hairlike protrusions. The only subjective symptom complained of has been a slight thickness of the tongue.

The prognosis is good and the disorder usually clears up with or without treatment, but may recur.

Many things have been employed in the treatment of this condition, among which we find the astringent mouth washes, carbolic acid, 5 per cent chromic acid, 10 per cent bichlorid, 15 per cent fibrolysin in a warm, aqueous solution, cauterization of the papillæ, painting with salizyl spiritus in a strength of 5 to 10 per cent, or with 2 per cent resorcin. Any gastrointestinal disturbance or abnormal condition of the gums or teeth should be corrected.

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SOCIETY PROCEEDINGS.

EASTERN SECTION.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL  
AND OTOLOGICAL SOCIETY.

BOSTON, MASS.

GORDON BERRY, M. D., CHAIRMAN.

PRESENTATION OF INSTRUMENTS.

**A Universal Coupling for Irrigating Cannulae in Otolaryngology.\***

BY LEE M. HURD, M. D.

**Foot Valve for Suction Apparatus—A Device to Increase Its  
Efficiency.†**

BY LEE M. HURD, M. D.

**A Bronchoscopic Double Point Grasping Staple Forceps.‡**

BY GABRIEL TUCKER, M. D.

**Retrograde Laryngoscope.||**

BY GABRIEL TUCKER, M. D.

**"Three Cases of Laryngeal Spasm Associated With Intracranial  
Hemorrhage in the Newborn."||**

BY DONALD E. MUNRO, M. D.

DISCUSSION.

DR. HARRY P. CAHILL, BOSTON: It is a pleasure to be asked to discuss Dr. Munro's excellent paper. We all know so little about cranial conditions in the newborn. This was brought out vividly to me five years ago, when I was called in consultation in the case of a newborn child of a dear friend of mine, and my knowledge was certainly hazy. I also noticed that the knowledge of the other consultants in the case seemed to be equally hazy. And Dr. Munro has cleared up all such cases so that we look to him in all such types in this vicinity. His work has been pioneer work. His labor in following up cases with 90 per cent of autopsies has yielded points that none

\*See page 768.

†See page 771.

‡See page 773.

||See page 775.

||See page 677.

could ever have obtained except with systematic work by one individual.

His first case of laryngeal spasm enabled him to make a diagnosis on the other two. We must learn that these conditions can take place not only in forceps cases and prolonged normal labor but even in Cesareans, and rarely, too, is there any fracture of the skull.

These injuries are of three types: Either the result of laceration of the sinuses, usually the longitudinal sinus, or of a cortical vessel, or an intraventricular hemorrhage. Rarely, too, is the lesion in the brain cortex itself—the brain cortex injury is due to abnormal intracranial pressure or to the accompanying cerebral edema. Here lies the value of lumbar puncture, both in diagnosis and in treatment for relieving the pressure. Daily lumbar puncture and removal of 10 cc. of the fluid until the pressure is down to 10 millimeters in the Langdon manometer is usually in order; and if the pressure is over that—that is, 15 millimeters—I think most men usually consider a decompression in addition. Thirty per cent of our retarded children are probably due to intracranial injury in the newborn. When we consider this, we begin to realize the importance of Dr. Munro's work.

DR. HARRIS P. MOSHER, Boston: Dr. Cahill has hit the nail on the head in this discussion. This is pioneer work. Dr. Munro is too modest. He said he was to learn from us. I doubt if he will learn much from us except possibly from our guests.

I don't see quite why he narrowed the obstruction to the lateral and third ventricles. I think his deaths come from respiratory failure, and I was waiting for him to put the clot in the fourth ventricle where the respiratory centers seem to be.

DR. FRANK E. MILLER, New York City: I would like to ask three questions: (1) In Dr. Munro's observations on intracranial pressure from hemorrhage, has the specific gravity of the spinal fluid ever been taken? (2) When a mixture of blood and spinal fluid was discovered, was the specific gravity of this mixture recorded? (3) Have any observations been made upon the specific gravity of endolymph and perilymph?

I am asking these questions because I am intensely inter-

ested in the matter of breath, blood and lymph pressure and the rôle of their specific gravities, especially of blood and lymph. Perhaps Dr. Munro might have made some experiments along this line in conjunction with his singularly unique and brilliant observations, that would throw light upon this subject.

May I ask also to have him quote his authorities, as it would be very helpful to anyone studying this subject?

We diaphragm the breath and the blood by means of the heart action, the lymph (perilymph and endolymph), by means of hearing, the drum being the diaphragm. And we diaphragm by means of the eye, the endolymph in connection with the brain and the various fluids of the eye.

We know pretty nearly the tension that it requires for a blood pressure to break into the lumen or into the confines of that which contains lymph.

We also know that we see no blood (except it is abnormal) in the lymph channels. Any information would be very satisfactory to know, and very helpful.

DR. D. CROSBY GREENE, Boston: I was interested to hear Dr. Munro's paper because he has brought out the importance of this group of cases in the differential diagnosis of dyspnea of the newborn. The commonest type of inspiratory dyspnea in the newborn, as I have seen it, has been the socalled congenital inspiratory stridor, a condition in which the obstruction is apparently not due to spasm but to a laxity of the tissues surrounding the upper orifice of the larynx. We have all observed these cases and seen them improve spontaneously in the course of a few years. Other causes of obstruction of the larynx in the newborn are tumors, especially cysts.

In reference to Dr. Mosher's point, it seems to me that there was unquestionably laryngeal obstruction, as evidenced by the inspiratory stridor and the thoracic contraction.

DR. MOSHER: Why didn't intubation help?

DR. GREENE: The laryngeal obstruction was only part of the difficulty.

DR. MOSHER: It was more than a laryngeal spasm?

DR. GREENE: Yes, but the laryngeal spasm was the outstanding symptom.

DR. DONALD MUNRO, Boston (closing): This is, I think, an almost impossible paper to discuss because I don't know

anything about it, and I find it difficult to answer any questions and do anything except reread the paper in answer to any questions. Dr. Greene, I think, answered Dr. Mosher's question. As I understood these cases, there was no actual anatomic obstruction in the larynx or in any portion of the air way. It was, as Dr. Mosher correctly points out, a pathologic process which was located higher than the air way and was located in the central nervous system. There was no clot found in the fourth ventricle in any of the cases. The clots were limited above the aqueduct of Sylvius.

In answer to Dr. Miller, I have never done the specific gravity of the spinal fluid, so I can't tell you what the normal is. I have no doubt it has been done and that it is in the literature and you could find it. I didn't do the specific gravity in any of the cases reported. It seemed to be a useless procedure from the point of view of acquiring more information. I not only do not know the specific gravity of the endolymph and the perilymph and the other variety of lymph which you mentioned, but I don't really know where they are. So I am afraid I can't give any information on that subject either.

#### HEADACHES.

##### **Medical Aspects.\***

BY ROGER I. LEE, M. D.

##### **Neurologic Aspects.†**

BY JAMES B. AYER, M. D.

##### **Endocrine Aspects.‡**

BY CHARLES H. LAWRENCE, M. D.

##### **Headaches and Referred Pains.||**

BY GEORGE H. WRIGHT, D. M. D.

##### **Ophthalmologic Aspects.¶**

BY WALTER B. LANCASTER, M. D.

##### **Rhinologic Aspects of Headaches and Cranial Neuralgias.§**

BY CROSBY GREENE, M. D.

\*See page 682.

†See page 689.

‡See page 694.

||See page 700.

¶See page 706.

§See page 715.

## GENERAL DISCUSSION.

DR. WILLIAM H. HASKIN, New York: I think the one main thing that has been brought out in these papers is the great necessity for all specialists to be good general practitioners, that the specialist, of all men, should not enter into any specialty until he has a pretty thorough knowledge of the whole body. I was trained in a women's hospital for two years and a half and was in a gastroenterologist's office before I took up nose and throat work. Most of my nose and throat work began in this gastroenterologist's office. He recognized the fact that most of his cases had trouble with the nose and throat; and it was my duty as his assistant to take charge of those conditions. Then I became connected with a dental college as professor of oral surgery. Not knowing anything about the teeth at that time, it didn't take me long to see that we were up against a serious problem, and after trying to impress the other professors with the necessity of the subject, I resigned and have been hammering away ever since upon focal infections.

There was one thing Dr. Wright didn't bring out. You have caries of the teeth, and although the pulp isn't exposed, you will find on examination that there are many bacteria present in the pulp and there has been an inflammation of the nerve pulp with a fibrosis, and later pulp stones and calcareous degeneration with hardening and disturbance in the teeth. Now this looks simple. I examined 300 teeth which had been X-rayed and extracted, and on examining the apices the majority of them, instead of having a single opening, had multiple foramina; so the problem of getting rid of your foci is a difficult one. You have several canals to clear out.

Then the question of impactions—we see that all the time. I had a patient sent in to me who was examined by an excellent nose and throat man, and he was due for an operation on the paranasal sinuses, the sphenoid sinus, and he had several X-ray plates of his teeth taken, but I did not believe that was the cause of his trouble. He had trouble with his eyes. He could see 20/100 in one eye and 40/100 in the other. But with the proper correction he was brought up to normal, and his headaches disappeared immediately after he got the proper glasses —his headaches were due to eyestrain.

There is another question on which we as specialists are way behind and don't know much about, and that is the question of the intestinal tract. I had my associate, Dr. Dwyer, read a paper on histamin. Now, histamin is a byproduct of faulty digestion of the aminoacids in the digestive tract. And almost all those patients (complaining of headache) will come in with a highly acid stool and a large quantity of mucus in the stool. You will examine those cases and find almost always that the bacilli coli communis are absent, and you will find a large quantity of histamin present, and that is a deadly poison, and I have seen it kill rats and guinea pigs quickly.

Another question is the presence of oxalates in the intestinal canal due to incomplete oxidization of carbohydrates. It is an interesting thing to follow this digestion of sugar. No two people will digest sugars in the same way. Some will digest dextrose and not maltose; and there are other sugars, and where you find that there is a large quantity of carbohydrates, you will find a large quantity of oxalates. These are some of the things to consider; and I feel that the nose and throat man will eminently have to be a general practitioner; and I hope the day is coming when no man will enter into the specialty of otolaryngology until he has a thorough knowledge of the practice of medicine.

DR. LEWIS A. COFFIN, New York: The ordinary pain from frontal sinus disease will hardly come under the head of headache, although complications like meningitis or brain abscess will be accompanied by true headache. The pain of uncomplicated frontal sinus is a regional pressure pain, neuralgic in character, like an earache. It is generally easily recognized on account of its periodicity, coming on shortly after rising and disappearing around midday.

Dr. Wright, referring to certain painful spots located as shown in this picture, said that he was able to rule out sinus diseases because, whereas the X-ray on anteroposterior exposure showed dark over the frontal and antral cavities, the lateral exposure showed these cavities clear. Now, as a matter of fact, a lateral exposure always shows these cavities clear unless occupied by bony tumors. So I feel that Dr. Wright's patient may have suffered from both frontal and antral sinusitis.

The general practitioner should profit much from this symposium. He is often guilty of lack of care in history taking and diagnosis before sending his patient to the specialist. Not infrequently patients sent to me on account of headaches, after an examination, will ask, "Doctor, do you think I need an operation?" I answer "Yes." And upon question as to the nature of the operation, I reply, "You need an operation of the bowels." Now, had this operation occurred before they were sent to me I would never have seen them.

Patients who come complaining of occipital pain radiating over the head to the frontal region are especially of this class —there are many causes of headaches, but very many of the headaches that I see are due to a constipated and poison filled gut. It may be from histamin, it may be from indol or skatol. For practical purposes, I find that the poisons seem to be in direct ratio with the amount of indol in the feces.

Dr. Coffin asked Dr. Lancaster if he considered that papillitis and papilledema, narrowing of fields, etc., meant necessarily brain lesion. Dr. Lancaster answered in the negative.

DR. LINN EMERSON, Orange, N. J.: I think there is one thing that we as doctors, or all doctors, in fact, do not take enough cognizance of, and that is the psychic element. Dr. Greene spoke of Dr. Sluder's results being due to his dominant personality. There is no question about that. Dr. Gould got his results from his dominant personality; and to the patient the proof of the pudding is in the eating. If you cure your patient with glasses, it makes no difference whether he needed glasses or not, if he got well from wearing them.

In school children the psychic element is all important. I have many children brought to me—you can't find anybody who has no error of refraction. Years ago I prescribed glasses more frequently than I do now. I relieved those children and cured them and I asked, how was the child getting on, and they said—the members of the family said—"Oh, he wore the glasses and got cured and threw them away." Nowadays I get the results psychically, not by glasses; but I ask the mother about the child's headache, Is this headache volunteered? I say that a headache that has to be extracted with a corkscrew isn't of much significance. We find in the better walks of life that these children are looked after. The mother says to Willie,

"Have you a headache?" and so he says, "Yes," and she takes him to the oculist and he prescribes glasses, and he gets rid of his headache and throws them away. The oculist was justified in prescribing those glasses, but the cure was psychic. I am getting cures in those minor errors by a heart to heart talk with the parents before the child, and I in some instances order the glasses and then say to the mother, "just as you have unconsciously magnified this headache, you can bring about its cure." He wears the glasses, and she says, "You are better to-day," and he wears them for a little while for school work, and then in a little while not at all.

Now, the enthusiastic man like Dr. George M. Gould got his results from thorough and careful refraction, which lots of oculists do not do; but the psychic element is very important, and we men are all so busy treating patients who are actually and seriously ill that we haven't the time to give to the people who are mildly and psychically ill, and what is the result? The chiropractor and the osteopath and the Christian Scientist gets the patient away from us, and he gets his results, and the nonreasoning and nondiscriminating patient has no way of knowing why he is cured, and the irregular and the quack gets the credit, and we are discredited. While if we gave a little more time to the psychic element, we would get better results; and if the man who knows nothing about medicine gets psychic results, surely the man who does know about it and who combines treatment with it is sure to get brilliant results; and we all know that the famous men throughout the world are men, as Dr. Greene said about Dr. Sluder, of dominant personality.

DR. LEE M. HURD, New York: I would like to ask Dr. Wright three questions:

An extracted tooth of the lower jaw, molar, followed by a complete trigeminal neuralgia, so bad it was never cured; in fact, injection of the Gasserian ganglion five times and extraction of the infraorbital nerve gave only temporary results. What happened to the dental nerve after the tooth was extracted? Did it curl up or get caught in the fibrous tissue?

Should impacted teeth that give no symptoms be touched?

In doing a radical antrum operation we probably regularly sever the nerves of some of the teeth; but we do not cut off

the circulation. The tooth is vital, lacking in innervation—am I right?

In his charts here we get pain from all the localities of the socalled Sluder syndrome except the vertex and larynx. And I think that Sluder is right, and regularly I relieve pains in those areas, excluding sinusitis, by treating the sphenopalatine ganglion. This fall I had a most unusual one—a man who had a small area of pain in the upper lip. In that area he had herpetic vesicles from time to time. This was cured by anesthetizing the ganglion on that side. Pains in all those areas will be relieved by anesthetizing the ganglion. The neurologists are not with us in this, but we do get results.

DR. JOHN MCCOV, New York City: After listening to this symposium, which has been exceedingly interesting, I am reminded of a story which I read in a magazine. An anxious father rushed into the doctor's office and said, "My child has just swallowed a button," and the doctor inquired whether it was a fancy, embossed button or a plain button; the father said that it was a plain button, and then the doctor said, "You must take the child to Doctor So-and-So, down the street, because I only remove the fancy buttons." So if I were an anxious layman, with a headache, I wouldn't know to which specialist to turn for my headache. However, to paraphrase the biblical saying, "The poor we always have with us," the rhinologist might say, "The headaches we always have with us," and we have to deal with them. The subject has been most thoroughly covered, so that it resolves itself down now to a recital of case histories.

Remembering cases I had where I got some success from injecting the sphenopalatine ganglion, I saw a case of acute ethmoiditis and sphenoiditis in a young healthy adult and, after opening the ethmoid and sphenoid, a severe pain on that side of the head was relieved, only to come on with greater severity than ever in a week. The next procedure was to inject alcohol into the sphenopalatine ganglion. This gave relief for two weeks, when the pain reappeared as bad as ever. It then occurred to us to examine the patient's blood, and a Wassermann was found to be four plus. Here was a condition where we were looking at the specialist's side and had neg-

lected the general side. The patient's headaches disappeared on antisiphilitic treatment.

Another case was a patient who was subjected to prolonged exposure and perhaps poor liquor. He finally developed an obliterative endarteritis of the leg, and his leg had to be amputated in the lower third. Subsequently this man developed severe pains all over his body, and they were eliminated by irrigations of the colon, all except a pain over his right frontal sinus. I was asked to examine the sinuses and found them normal. I determined it was a supraorbital neuralgia and ordered the injection of alcohol into the supraorbital nerve. That was a year ago, and the man has been free from pain ever since, but before that he had been unable to sleep on account of the severity of the pain. What caused it I don't know, but we did succeed in relieving him.

Another point—we frequently find as a result of removal of the tonsils a relief from various conditions, especially headache. It has been my practice to take my own X-ray pictures of the sinuses, and it has been astonishing to see the amount of cloudiness in the sinuses of people who complain of headache—to see the amount of cloudiness in the sinuses or thickening of the margin of the sinuses, and then after removing those tonsils and subsequently taking a picture of the sinuses to see how the cloudiness of the sinuses and the headache will disappear.

Now, when we listen to the description which Dr. Greene drew for us of the branches of the sphenopalatine ganglion supplying the sinuses, also the tonsil region, and how these nerves connect with the sensory branch of the fifth nerve, it is astonishing to me, with such thickening of the nasal membranes around the sinuses, that we do not get more headache, because many people do not have headache, although they have thickening of the sinuses.

In conclusion, I would like to ask Dr. Wright—Has he seen any cases of Paget's disease in which there was a concentric thickening of the bone? These people regularly complain of neuralgia, and I would like to ask—Would he think that placing the gold foil in these conditions would give any relief?

DR. EDWARD B. DENCH, New York City: There is one question I would like to ask Dr. Ayer. He said he had seen certain

cases of brain abscess, both above and below the tentorium, without headache. I have never seen that and would be obliged if he would say something more about it.

With reference to Dr. Wright's remarks, and to show what impacted teeth will do—I remember one morning one of my medical students brought his sister into the hospital and wanted me to do a double mastoid on her because he thought she had a double mastoiditis. I examined the ears and found them normal. I sent her immediately to a surgeon dentist, who found four impacted wisdom teeth and extracted them, and she had the first good night's sleep in four weeks. So that shows that the medical man isn't always successful in making a diagnosis unless he makes a thorough examination as well.

I am also glad to hear that the pendulum is swinging in the other direction now and that the nasal accessory sinuses are not operated upon as frequently as they have been. I am very certain that during the last decade many ethmoids and sphenoids have been opened where there was practically no indication for the operation. Many of these cases, where the sinuses are quite badly inflamed, will recover without operation, and I am very glad that at this meeting we are advancing the opinion that indiscriminate operation upon the nasal accessory sinuses is to be avoided. Having been in practice a long time, I see in consultation many cases which have passed through other hands, and it has been my unfortunate experience to observe a large number in which the sphenoid and ethmoid have been exenterated unnecessarily.

Only a few weeks ago a patient presented herself at the New York Eye and Ear Infirmary complaining of severe headache and pus in one antrum. My house surgeon had X-ray plates made and found cloudy sphenoids and ethmoids. He said that he thought that the accessory sinuses should be operated upon. I recognized the patient at once as having been in the hospital before. A thorough exenteration of the sphenoids and ethmoids had been done on a previous occasion. Incidentally, the woman had a four plus Wassermann. The headache, of course, was due to her cerebrospinal lues and not to her accessory sinus condition.

DR. LEON E. WHITE, Boston: I think we have been extremely fortunate in having this subject presented to us in

such a sane manner. Each paper has been a masterpiece in its way, and I am in accord with what Dr. Greene said on the sinuses.

There is one case we have been following recently, which Dr. Ayer has seen, that illustrates the terrific pain from a cyst or some disturbance in the pia arachnoid. This patient had had a radical ten years ago. It wasn't successful—a facial followed it. The radical cavity was never dry. He was sent to me recently at the Infirmary with a question of a brain abscess. We looked him over carefully. Dr. Ayer saw him. The sensory and motor tracts seemed to be all right. His eyes were normal. His spinal fluid wasn't under pressure. He had had frequent headaches, which became very intense, and it seemed to be compulsory that we should make some effort to determine whether he had an abscess in his brain that was responsible for the pain. There were granulations on the top of the radical cavity. I felt that there might be an extension into the temporal region and did a temporal exploration. I went down and removed the bone underneath the brain in the temporal region and got a good exposure and found adhesions extending from the radical cavity to the dura. I split the dura, which seemed to be under pressure, and a large amount of apparently normal cerebrospinal fluid escaped. I explored the brain in all directions, but did not find an abscess and was rather disappointed. I didn't feel that I had done enough to relieve the patient. We closed the wound and it healed by first intention. The headache was entirely relieved, and the man has not had any more vomiting or other symptoms and has been apparently cured. I think possibly he had an involvement of the pia arachnoid, possibly a cyst, and the splitting of the pia let it out.

I had another case of marked papilledema—i. e., 5 D., which had had a mastoid operation which didn't do quite right. The case was sent to me for investigation. We didn't find any disturbance in the motor tract except possibly a slight weakness of the rectus on the other side. He had a terrific headache with marked mental disturbance, some elevation of temperature and slow pulse. With this marked papilledema Dr. Ayer thought it would not be safe to do a lumbar puncture, so we first did a puncture of the lateral ventricle and, after drawing

off some of the cerebrospinal fluid, did a lumbar puncture. With a manometer in each canula it was possible to obtain the variations in pressure between the lateral ventricle and the spinal cord. In case of a block between these two regions the pressure would be different, while if the passageway was free it should be the same. Owing to a faulty connection in one of these manometers the test was not quite satisfactory. There appeared to be, however, more pressure in the spinal column than in the lateral ventricle, so an exploration of the cerebellum was done, which was negative. The headaches were temporarily relieved, and the case is still under observation.

DR. EUGENE A. CROCKETT, Boston: I am much interested in what Dr. White just said, because there is a possible explanation for his case of arachnoid cyst which has not occurred to him. It reminded me of a case I had four years ago, which I saw many times in consultation but didn't operate on, but I agreed that she should be operated upon. She had all the symptoms of an abscess in the parietal lobe. She was operated on three times for the relief of persistent headache, with temporary improvement each time. She got no permanent improvement. The only thing found at operation was an apparent arachnoid cyst. The amount of fluid that came out was more than usual. That was a point that was hard to tell. At any rate, in the follow up, two years later, I wrote to this woman and got a haughty letter in reply. She said the Massachusetts General Hospital had failed and that she had taken up Christian Science and was cured and had had relief for a year. My conclusion now is that there was not an arachnoid cyst, but that we were all mistaken and the case had nothing but hysteria.

I wish to add my note of approval to Dr. Greene's paper. I was interested in the conservative attitude he took, and also in Dr. Dench's attitude on sphenoid and ethmoid cases. My experience is the same as his, and I am convinced that a vast number of ethmoid operations are done for the relief of pain where the operation is a futile one.

DR. JAMES B. AYER, Boston, in reply to Dr. Dench: In order to bring out my point that a tumor which causes displacement of the brain is accompanied by severe headache and that abscess which erodes the brain is accompanied by less marked

headache, I have evidently overstated the facts. However, I have seen abscess of the brain with no complaint of headache from the patient.

Concerning Dr. Crockett's patient: She came to see me a year after her recovery, which commenced the day of her departure from the hospital and coincided with the beginning of Christian Science therapy. I can vouch for her excellent physical health at this time. I then took occasion to review critically the records in her case. Not one finding was set down which indicated with certainty structural disease of the central nervous system. Certainly there were no signs of increased intracranial pressure.

In closing, perhaps you will excuse my somewhat poorly balanced paper, which has been designed to stress the importance of pressure in the mechanism of different types of headache.

DR. CHARLES H. LAWRENCE, Boston: There are three points which I would like to emphasize:

1. That the endocrine aspect of headache should be considered by the internist and not by the specialist. It should be considered only after a careful history and complete physical examination have been obtained. I believe very strongly that endocrinology is properly only one aspect of general medicine, that its problems are very intimately connected with general medicine and that they can only be solved by men who have had training in general medicine plus, perhaps, special training in metabolism work. By metabolism I do not mean basal metabolism, but all those processes concerning the bodily nutrition.

2. The point has been raised that constipation is a very common cause for headache. My experience does not quite agree with this. Constipation is commonly associated with headache. That is, a great many people with headache are constipated, so also are a great many people without headache. It is often felt that the fact that a dose of salts, taken because a patient is slightly constipated, will relieve headache, is proof that the constipation caused the headache. My own belief is that often the relief from headache comes before the bowel has been emptied and is due to the salts lowering intracranial pressure and not to the relief of constipation. In my experience, only a small proportion of patients are relieved of headache by

correcting their constipation, and a larger number are just as constipated and have no headache at all.

I have one patient, 56 years old, whose bowels have moved only once a month since she was born. She has never had headache. It seems to me that there is a great deal in the personal equation. Some patients tend to have headaches as the expression of deranged bodily processes, and other patients express the same derangements in different ways.

3. The question of the relation of sugar metabolism to headache has been raised. We still know very little about metabolism of sugar. It is only in diabetes that it has, exhaustively, been studied. We find in our endocrine cases that the determination of the individual sugar tolerance is an extremely valuable means of diagnosis, because it varies definitely according to the endocrine glands involved. What the effect of this variation of tolerance may be is not yet thoroughly understood, but it seems to me that the disturbance of carbohydrate metabolism may account for some of the headaches which are not explained by local pathology.

DR. GEORGE WRIGHT, D. M. D., BOSTON: In answering Dr. Haskin's question with reference to the status of the pulp and pulp stones. I am in entire agreement with him that fibrosis may take place in the pulp of the tooth, which may give rise to pain and pulp stones. It is a fact histologically that the apex of the tooth doesn't always present that beautiful single foramen which is pictured in the textbooks, but there is a delta of foramina at the end of the tooth root. In this connection, when a dentist takes out a pulp and calls it a dead tooth, he's entirely mistaken. A dead tooth to be a dead tooth must include the dentine with its organic tissue within—i. e., the fibrils, but must include the periodontal membrane which holds the tooth in the socket; and you get that condition in a long standing abscess or where arsenic has been left in for a long time. There has been a source of nutrition outside of the tooth other than that which comes in through the apical foramen. That is important. If a tooth is entirely dead, then removing the pulp isn't sufficient. You will have in addition detritus and bacteria within the tubuli of the dentine as well as a devitalized membrane in the tooth socket, and then you will have diffusible toxins and single and multiple abscesses,

and that diffusibility will depend on whether the membrane is permeable or semipermeable or impermeable and so govern the diffusibility of the toxins from the diseased teeth.

Dr. Coffin said that a lateral view of the frontal sinus would always show clear. I should take issue with Dr. Coffin in that respect. You will have variations anatomically in the faces of everybody in this room, and those who feel particularly interested in that phase of anatomy will see the variations, possibly a hundred variations, here in the Mosher collection, sections of atra and frontal sinuses to which I call your attention. Those variations will give you variations in the picture you take of an antrum, frontal or lateral view. You get variations if there is a mucosal engorgement; you get variations if there is a keratitis or calcification or extra septa, or if there are one of four types of polypi—the gelatinous, plus infiltration of the capillaries, and a third type with fibrosis, and a fourth type with calcification. You may take all kinds of views, with these variations from normal, and they will show cloudiness. Certainly if you have a tumor in the sinus, there will be a lesser clarity in that lateral view.

Dr. Emerson spoke of the psychic element in children. If a child comes to the dentist's office and you put him into the chair and you allow him to see all the things about the office and haven't hurt him, he considers his visit a picnic; he will come again. But if those children hear discussions about toothache, they will manufacture a first class toothache and you find no cause for it. You have to be on the lookout for those psychic elements in children.

Dr. Hurd asked a question with reference to the extraction of teeth in relation to the sinuses and the question of the lack of nutrition. It will depend somewhat on the technic of the operator whether nutrition has been changed. If an operator going into the canine fossa to explore the antrum has made his incision too low or has been unmindful of the teeth or has cut off the apices, you certainly will have devitalized pulps, and then, if there are pathogenic bacteria in that region, there will be an invasion of the pulp, although the tooth is clean on the outside, and an X-ray will show it to be perfectly free and no structural change in the tooth. The answer is, how near you operate to those teeth, whether you are going to interfere

with the vitality or not. And then if you examine after a month and you find they are devitalized and wonder why you are having a recurrence of the antral disturbance, then it behooves you to investigate those teeth and open them, and in all probability you will find the pulps infected, and you will not have a restoration of the antrum if you have infected those teeth and leave them untreated.

Paget's disease—Dr. McCoy—I have never had a case of Paget's disease with reference to blocking or inhibiting the proliferation of the maxillary or mandibular nerve. I should be rather inclined to think that blocking that nerve with gold foil would have little effect. I shall take occasion to try it out.

The ear reflexes with reference to the third molar are common, and pains in the ear are common, and it behooves us not to take the mouth for granted, but to account for the teeth and their evidence of pathology. Pressure changes locally do account for pain. Dr. Ayer made a suggestion—where we have pressure changes in the fluid about the teeth, bathing the teeth, and if there is an abscess sac developing, there will be a pressure, and there will be an osmotic change. The fluid will go from the outside into the inside, and there will be a change, and you will have local pressure pains. When the local pressure isn't great, we may have pain due to a diffusibility.

Another question—if you find impacted, unerupted third molars, should you remove them? I let sleeping dogs lie unless there is a bad reaction with recurrent local or referred symptoms of pain, or where there is definite crowding of the anterior teeth causing malposition due to pressure from the third molars.

DR. D. CROSBY GREENE, Boston: I have very little to say except that I would like to correct any misapprehension in regard to my attitude toward Dr. Sluder. I think the profession owes Dr. Sluder a great debt because of his remarkable work in relation to the sphenopalatine ganglion. He has opened up a field which to us is of the greatest importance. I have repeatedly demonstrated to myself the value of his method of anesthetization and treatment of the sphenopalatine region. But what I did wish to emphasize is that those of us who have followed Sluder haven't got that proportion of favorable results which he has. It may be due to our lack of technic, but I think

it is in large measure due to other elements which enter into the case. Even where there is definite pathology in the region the operative treatment does not always result in freedom from headaches, even in cases where headache is relieved by anesthetization of the sphenopalatine district.

**The Nonsurgical Treatment of Nose and Throat Diseases.\***

By PERRY GOLDSMITH, M. D.

**The Nonsurgical Treatment of Ear, Nose and Throat Diseases—  
Ear Phases.†**

By D. HAROLD WALKER, M. D.

**The Newer Methods of Intravenous Therapy in Septicemias of  
Otitic Origin.‡**

By C. T. PORTER, M. D.

**The Influence of Climate in the Nonsurgical Treatment of Ear, Nose  
and Throat Infections.||**

By FRANCIS P. EMERSON, M. D.

**The Relation of Diet to the Nonsurgical Treatment of Diseases  
of Ear, Nose and Throat.||**

By D. C. JARVIS, M. D.

**Roentgen Ray Therapy in the Nonsurgical Treatment of Ear, Nose  
and Throat Diseases.§**

By D. C. JARVIS, M. D.

DISCUSSION.

DR. THOMAS J. HARRIS, New York City: Mr. President and Gentlemen—Before I say what little I have to say, I want to take this opportunity, before it is too late, to express my personal appreciation, which I know is the appreciation of every man here, of the wonderful meeting that Dr. Berry has gotten up today. (Applause.) It is really a remarkable meeting that the Eastern Section, that the men of Boston, have pulled off, the most remarkable we ever have had.

There are many things I would like to speak of, but there are three outstanding papers I would like to say a word about.

\*See page 727.

†See page 744.

‡See page 749.

||See page 754.

§See page 757.

§See page 761.

First, in regard to Dr. Porter's paper on intravenous therapy with mercurochrome—it was of great interest to all of us to hear of his success. It is my hope at the May meeting to report a case successfully treated by this method, with emphasis on another line; but I want to say this—that it is a measure that every one of us should be acquainted with and make use of with no great hesitation. We were warned by the medical men to look out after the treatment, to beware of an acute kidney involvement or this or that serious complication; and nothing of the sort took place. And as Dr. Porter said this afternoon, none of his cases showed any serious complication whatever. It is a measure which I hope in properly selected cases will have wide employment.

My second observation is in regard to Dr. Emerson's paper. I know that he likes to have New York men disagree with him, because he thrives on difference of opinion. I was wondering if all our observations agreed with Dr. Emerson's when he said that an outstanding condition of the nose or throat or ear requiring operation would not be improved by climate. It is my own observation that there are conditions of the ear and also of the sinuses of an inflammatory nature and having a certain amount of suppuration which have gone away to a different climate and have come back to us with no treatment at all and with the condition decidedly improved. This is true of tubercular lesions of the larynx, where the particular infiltration has cleared up rather promptly by a change of climate without any surgical treatment whatever.

The last observation is in regard to this very excellent paper by Dr. Jarvis. I don't know when I have had the pleasure of listening to a finer paper. It raises the question which a great many have been paying attention to, namely, in regard to the ability to improve the hearing by means of the roentgen ray. I refer, of course, to the more serious cases of deafness, and I assume that Dr. Jarvis didn't refer to that. But from the experience we have had in New York, there has been uniform failure. We have been following up the work there, and up to the present time we have never been able to find that there has been one decided case of improvement in the hearing, in spite of all the claims that have been made, and this I say with a great deal of confidence, because the work has been

thoroughly checked up. Dr. Jarvis comes forward and takes the selected cases and says it has nothing to do with the pineal gland or the pituitary body but that it has something to do with the lymphoid tissue. Certainly it has something to do with the lymphoid tissue, and his results will lead us to use it more and more where it is truly indicated.

DR. LEE M. HURD, New York: I can report 60 cases with no improvement whatever from X-ray treatment of the ear by the socalled Stokes method.

In X-ray treatment of tonsils, I found that there were little or no results, but I found in this work that the hearing sometimes improved. The youngest patient was about 45; the others from around 60 to 65. There were five cases with improvement in hearing.

The unimproved cases that had at least eight treatments with X-ray were 8 cases; and there were 12 cases that had three doses or less and did not continue; 25 cases in all, 5 with improvement; 8 who went through a sufficient amount of treatment with no improvement; and 12 cases who ceased treatment.

The dose was 5 inch spark gap, 10 inch distance, 1 millimeter aluminum filter, 5 milliamperes, time 3 to 3½ minutes.

DR. JOHN McCoy, New York City: The early papers dealt with matters which were familiar to all of us, but the paper on X-ray, I think, leaves that matter somewhat in doubt. There are two methods of applying the X-ray to improve hearing. Dr. Harris spoke of one, which is known as Dr. Stokes' method. The other method is that of Dr. Witherbee. Witherbee first used his method for the shrinking of tonsils and he still advocates it. He gives a smaller dose of X-ray for a longer time. In other words, Dr. Stokes makes a 15 to 30 seconds application in four positions, directing his X-ray to the pituitary. Dr. Witherbee gives a four-minute exposure, directing his X-ray to the tonsil.

I have tried both methods. I have tried the treatment for the reduction of the tonsils on cases that I have considered unsurgical, and I must say that I was disappointed in every case, and not only was I disappointed in my own cases, but in cases that had been treated by Dr. Witherbee himself, on

whom he claimed he had a wonderful cure, but who reported a year afterwards to me that they had an acute infection of the respiratory tract, and it was remarkable what a lot of pus I could get out of those tonsils with suction.

So I am inclined to think that X-ray treatment of the tonsils does shrink the tonsils somewhat. Whether it is by direct action on the lymphocytes or round cell infiltration, or whether it is, as the doctor explained, by producing obliterative endarteritis and producing an unsuitable soil, I am not prepared to say. However, the tonsil does shrink—there is no question of that—but it does not disappear, and in several instances where patients have had prolonged X-ray treatment of the tonsils I have removed them surgically, and have been surprised to see the large tonsils I have been able to secure.

Now, in regard to the X-ray treatment of the ear by the Stokes method. Dr. Stokes thinks, by applying his X-ray at a distance of 15 inches from the patient, that he reaches the pituitary body. That has been very severely questioned by men of great ability with X-rays. In other words, they claim that his dose has not sufficient power to penetrate underneath the skin, so that they question gravely whether it reaches anywhere near the pituitary. However, we are concerned with results rather than how we get them, and I have been using both X-ray methods for about two years now, and I have used it on some 200 cases. I use it as an empirical method. First I remove foci of infection and note what results I would get with the ordinary methods of treating the ear. As a result of observing those cases, and by the use of both the small and the large dose of X-ray, I would say that one in 14 cases was improved—and markedly improved—so I think that here we have an empirical method which, whether it acts by reduction of the lymphocytic tissue or absorption of infiltration, there is sometimes a decided effect. It is easier to politzerize a tube after than it was before—the tube becomes markedly opened—whether it is by the absorption of this infiltration by shutting off the blood supply, I am not prepared to say; but I think it is a method worth trying empirically; and whether, as Dr. Jarvis puts it, it is inclined to take a leading part in the treatment of the nose and throat, I think it is not, but it is worth trying.

Now, there is another empirical method which has not been mentioned and that is the ultraviolet ray. A number of men have written to me, asking what results I have gotten with the ultraviolet ray. The ultraviolet ray is wonderfully useful in treating superficial infection. It is perfectly remarkable how the application of the ultraviolet ray to furuncles in the nose or ear will absolutely destroy them, will almost immediately take away the pain and cause a disappearance or a destruction of the staphylococcus which is the cause of those conditions.

As regards its use in the nose and throat, I have tried it empirically, and as yet I do not feel able to make any report on it. I am inclined to think it is helpful in cases of superficial infection.

DR. WILLIAM H. HASKIN, New York City: I want to disagree with Dr. Emerson and say that we live as near the water as anybody can; and I want to say that the majority of my cases of acute disease of the respiratory tract improve more rapidly when sent to Atlantic City than when sent to the interior. I believe the result is due to climate, as it is the influence of the atmosphere; but we all live in atmospheres which are too dry and always hot. I have a hygrometer in my house and in my office, and in my office with the steam going it rarely gets over 20 degrees, whereas the normal is 50. That means that your mucous membranes have to do an enormous amount of work all the time and you have a wearing out of the vaso-motor control. It is a vaso-motor control disturbance rather than a cold in a great majority of the cases.

Then again, in the cities another thing we have is the presence of an enormous amount of dust. As soon as you get your patients away from that dust to Atlantic City they are out of doors. If they go to the interior, they stay indoors, but in Atlantic City they get into the wheel chairs and have the benefit of the sun and air and get well.

Another question in regard to treatment which has always been a hobby with me is the use of suction. I believe I first introduced suction into the minds of doctors in 1910. Many of my friends called me "Sucker Bill," but I see that most of my friends have their offices equipped with suction apparatus. They not only remove secretions but in a great many cases

get the Bier effect from increasing the hyperemia of the tissues, and in your chronic ear cases you can derive benefit by thoroughly sucking out the ear where it is impossible to wipe it out.

Now, another suggestion in the question of local treatment which I found last summer to be of value—it knocked Vincent's angina as quick as anything I ever saw. Dr. Abraham suggested its use, and it has been developed by a number of surgeons. It is a combination of two dyes, acriflavin and gentian violet, and it is called acriviloet. One dye destroys Gram positive bacteria and the other destroys the Gram negative. You combine the two and have a dye that will destroy both forms. It will also work well in these furunculosis cases —just put a poultice on. I have been using it since last summer with a great deal of benefit.

DR. TALBOT R. CHAMBERS, Jersey City, N. J.: I have an incomplete report to make of the action of X-ray on deafness and tinnitus. From two to seven exposures were made since last May. It is an incomplete report, preliminary to full report later.

Dr. Homer Axford, at the Jersey City Hospital, made about 300 treatments on fifty individuals, ranging from 18 to 70 years of age.

Five milliamperes, seven inch spark (medium point gap), three minutes, twelve inches distance, and one filter was employed.

Each case has its previous history, record of tinnitus, watch, whisper, voice, low tuning fork, Galton whistle, acumeter and Rinne test.

None was made worse for hearing while three claim tinnitus was worse.

Deafness: Not improved 10, improved slightly 8, markedly 2, and 1 was cured (resigning from the League for Hard of Hearing).

Tinnitus: Not improved 9, improved slightly 3, markedly 7, cured 3, and 3 were made worse, they claim.

The Western Electric Co. kindly loaned the league an audiometer, which records on a dial the exact quantity of hearing, and 100 means perfect. None obtains that. None of our tests showed over 50, and at that the improvement in

the few tested showed only 5 per cent improvement, and several loss of the same amount.

The X-ray has power for good, and it remains to be developed beyond the present experimental stage.

DR. ISAAC M. HELLER, New York City: I want to touch on one point that Dr. Porter spoke about, and that is the use of ether in chronic suppurative otitis media. If I understood him correctly, he said he wasn't particularly impressed with it. I have used it only for a short time and perhaps not long enough to speak about. However, I think it is worth while to bring it before the society. I had one case of chronic otitis media which had resisted all the former methods of treatment, as alcohol, etc., and I read this article by an author—I can't recall where it was—but he had such success with it that I gave it a trial. The exuberant granulations shrank to one-tenth of what they were, and the ear was dry, and the perforation was considerably smaller than it had been before. The drum was three-quarters gone, and now I can see an amount of restoration of the drum. Before I couldn't see the tympanum. So I felt encouraged. In this article the statement was made that the ether did this—it shrank the granulations, gave more space for the pus to come out, and by its solvent effect on fat it dissolved the fatty elements in the discharge so that the discharge became thinner and ran out more readily and increased drainage. Certainly in my case it did that, because the discharge at first was thick and then it became mucoid.

Dr. Emerson spoke about climate. There was one point he did not mention, and that was the effect of getting away from your habits and business. I think that one of the good effects we get from having a man or woman get away from home results, not from the climate, but from the change in routine. I knew a man who said he could cure any cold if he could keep the patient in bed for 48 hours and give a purge.

I think that that is the big point we gain by sending patients elsewhere. They get away from their office and their work, and they probably take much better care of themselves than they do at home. I think that that is the reason why Dr. Haskin's patients get well in Atlantic City and not in New York. But one cannot deny that climate plays a part. For instance, I had a patient with a constant discharge, and she went to Southern

California, and she wrote me that she was cleared of her symptoms. Of course, there was a radical change.

Another point why we have no change, and that is the automobile. We have thousands of automobiles in the streets, and they turn up quantities of dust, and the exhaust does harm, and we all get it in the nose and throat. The man in the country gets less dust and less germs in the air.

DR. F. T. HILL, Waterville, Me.: I want to mention an important point referred to in Dr. Walker's paper, and that is the use of the radio and the benefit patients with chronic secretory ears get from it. I have had the privilege of seeing a number of deaf cases in a state tubercular hospital up in Maine, and about two years ago a radio apparatus was put in with head phones for each patient. It has been interesting to see the improvement in the hearing in some of these old cases of chronic catarrhal deafness and in cases with healed chronic suppurative processes in the ear. I haven't noticed any improvement in ears that were wet, and would like to ask Dr. Walker if he has noticed any improvement in that condition and any improvement in cases of otosclerosis.

DR. FRANK E. MILLER, New York City: Dr. Goldsmith's most valuable contribution upon the use of various remedies which can be used in the place of operative procedures interests me very much.

Dr. Harris and others have made allusions to Dr. Stokes' X-ray therapy. I sent to Dr. Stokes for treatment and observation 32 cases that he made reports upon at the Academy, and requested him to report his findings to our New York Academy, so that we all might be interested in the results, and make them, if possible, definite ones, so that we might arrive at safe and sound application of these remedies, concerning which there has been so much discussion.

Twenty-four years ago, while using the X-ray in conjunction with Dr. Caldwell and Dr. Frank Hartley and Harry Loomis, there was installed in New York Hospital a Wappler's apparatus for X-raying. With an identically similar apparatus I made X-ray examinations of over 2,000 diaphragms in action. My hands tell you the story. They were much worse than they are now. Such an agreeable and remarkable change has occurred to the keratoses, through the use of an ointment,

that I have taken occasion to recommend it to fellow sufferers. It works well in old as well as new X-ray burns. The formula, as published by Upjohn, is 1/7 carbolic acid, ergot and cold cream.

I have given much time to the study of radium and X-ray, but, above all, to electrotherapy and electrical oscillating systems. If those who are interested will still keep up their endeavors, we will surely develop a selective ray for malignancy other than what we have at present.

Dr. Witherbee was mentioned. I also have sent him many cases, especially tonsillar cases where it was deemed advisable not to excise them, and I know of the excellent results of the methods employed by Dr. Witherbee; also of another good man, Dr. William Bryant Long, of the Crocker Laboratory of St. Luke's Hospital of our city, who has produced uniformly good results, and who speaks of them with due prudence and caution and with great modesty.

Then there is the charging and retained charge of colloid substances from the standpoint of determining the electrical control and obtaining the plus positive charge; for instance, of different forms of malignancy. We can have results better than we do now, in superficial epitheliomata, by radium and X-ray, by properly selected inductancies and capacities of an electrical frequency oscillation circuit of any desired frequency and polarity, by means of rectification filters. Applying such principles, we certainly will obtain something in the more complicated cases of carcinoma and sarcoma.

DR. PERRY G. GOLDSMITH, Toronto: If you will permit me I will say something in regard to deafness—the psychology of the deaf is a very interesting study. It is not, in my view, of much value if a patient hears a watch better than on a previous occasion. The voice test is the one of value to him, and unless he hears conversation better it is immaterial how much improvement other tests show him.

The chronically ill have added to their disability in nearly all instances a functional condition which in some cases may be of greater importance than the original illness. The deaf are no exception to this rule, and one must take it into account in estimating the amount of improvement in those cases of deafness that are usually very disappointing in treatment.

Listening, too, is a motor act, and prolonged action invites fatigue. The deaf person who goes to a lecture or to church finds he has to listen hard in order to hear, his lip reading not being sufficient. He may succeed, after some effort, and hear all that has been said, but if the lecture is long, the hearer finds himself tired out. If his effort to hear is annoying, or for some cause not resulting in sufficient interest, he suppresses his hearing by ceasing to listen. If the listening effort is not used fully because of its uselessness or fatiguing results, it becomes reduced in a large measure. The patient is then much worse because he ceases to listen. The improvement following some simple but novel treatment reawakens the listening effort and the patient hears better. In estimating the degree of improvement a chronic deaf patient receives there are many pitfalls.

DR. D. HAROLD WALKER, Boston: In the short time which Dr. Berry gave me I did not want to take the time up in discussing X-ray. Dr. MacMillan is treating patients by that method. He has not published his results, but I understand he has obtained some success and believes this is due to a lessening of the lymphoid tissue in the pharynx and descending lateral bands.

Dr. Hill's question with regard to the radio—I know that a number of deaf persons hear better with the deaf ear, and it must be from bone conduction. I do not think they hear better when the ear is discharging—naturally they would not; nor do I think that cases of otosclerosis are improved in the slightest degree.

DR. FRANCIS P. EMERSON, Boston: I find that I agree with the New York men rather better than usual.

In regard to Dr. Harris' comment—I think he must have misunderstood me. I said that even in deep infections climate was a valuable adjunct; and I should agree with Dr. Haskin that any patient leaving New York for any other climate would be benefited. (Laughter.)

DR. D. C. JARVIS, Barre, Vt.: One seems to get results with roentgen ray therapy, but results are only obtained in a certain type of case, which is best selected by the nose and throat man. The results secured, plus the necessary limitation of its use, do not seem to warrant roentgen ray therapy occupying a pri-

mary position among therapeutic measures. It is necessary to return to fundamentals from time to time and make clear to oneself just what one wishes to accomplish. If an examination of the nose and throat discloses a suitable preparation of the soil, and an adrenalin effect is desirable, then it seems possible to obtain this effect for a long period of time by using the roentgen ray. Cases of intermittent deafness seem to be adapted to this form of treatment.

My experience agrees with that of Dr. Harris in that results are not obtained in advanced cases of impaired hearing.

As one works with diet and roentgen ray therapy, one is inclined to use the roentgen ray less and diet more, for the results obtained from regulating the patient's diet are lasting, while the first head cold is apt to undo most of the results obtained from roentgen ray therapy.

With reference to the ultraviolet ray, I have had very little experience with it in treating cases of impaired hearing, but if it is of value in furuncle of the auditory canal it may have an action similar to that of roentgen rays seen in the treatment of carbuncle. Oftentimes the change in climate means a change in diet, and at times one has to analyze the change and determine whether the change in diet cannot be approximated at home.

#### EVENING SESSION.

DR. W. H. HASKIN, New York: This meeting is entirely arranged by Dr. Berry. We are greatly indebted to Dr. Fletcher and also to these other societies who are cooperating with Dr. Berry in getting up this splendid meeting. This meeting was brought up originally by the ear, nose and throat men. Of course, our great interest is in sound, and the problems of sound are tremendous. Most of our deaf people can hear music, but the great difficulty is a speaking voice; and I am very pessimistic about what I am going to get from Dr. Fletcher.

The subject of the meeting is "sound." The difficulties of lip reading and hearing can be quickly shown when we consider the "sound," which is the topic. We are warned of danger by the ringing sound of the fog bell, which is made to sound the sound in the Sound.

When we are through, we may be convinced; but I doubt it.

**Address and Demonstration on Sound Perception.**

BY HARVEY FLETCHER, PH. D.

DR. W. H. HASKIN: This is the first attempt to get together a number of scientists for the purpose of discussing sound. The importance of a more thorough knowledge of sound is obvious. It will be appreciated that it is the fundamental principle or base. We are very fortunate in having for the next speaker one who, because of his experience, is especially adapted to discuss the address. I take great pleasure in introducing Dr. Crockett.

DR. E. D. CROCKETT, Boston: When Dr. Berry wrote me, about a month ago, and requested me to discuss the talk of this evening, I endeavored by every possible means in my power to avoid the possibility. Dr. Berry assured me that it was one of the first meetings of the sort; and, as a preliminary to such meetings in the future, it was necessary that a physician be sacrificed. I understood it was to be elementary. If this discussion was elementary, I should not care to have to follow Dr. Fletcher when he gets really technical.

I was enormously interested. I must confess that I do not feel particularly capable of discussing what he has said.

One point occurred to me as he spoke of the physiology of the cochlea. The experience of investigators in the past has clearly proved that the deafness which involved the inner cells of the cochlea and the middle ear was always accompanied by high tone deafness. We know it from animal experiments and from postmortems. In the form called "boilermakers'" deafness, examinations always show degeneration of the nerve fibers in the basilar membrane in the region nearest to the middle ear.

We also know from animal investigation that a lesion which affects the cochlea in the region of the helicotrema is accompanied by a bass tone deafness; so that pathologic clinical investigation bears out the experimental findings.

I might make a few didactic assertions. It is a matter of common knowledge that the shape, size and direction of the external ear have no effect upon the acuteness of hearing. The external ear can be entirely lost without any demonstrable effect occurring. The size and shape of the external auditory

organs—the drum membrane, and the three ear bones are not essential to hearing. They are probably an obstacle to hearing. When an opening is made in the drum membrane, the hearing of the high tones, especially, is for a short time increased. The essential part of the hearing apparatus is undoubtedly the cochlea; the stapes, or stirrup bone, is necessary for the conduction of sound to the internal ear. The middle ear has to exist as a protective mechanism.

It also may be interesting to note that there are two intersecting muscles in the top—one that tightens and one that loosens the apparatus. I was rather surprised to hear that Dr. Fletcher made no mention of those muscles at all. They seem to have some effect upon the acuteness of tone transmitted to the cochlea. These muscles are of the enclosed type, and maintain the air pressure between the drum membrane and the inner ear; and they are also important for the acuteness of hearing and the preservation of a tone. We do know that the automatic muscles act as a protective mechanism of the drum membrane for a very considerable period in the case of boilermaker's deafness. It is only after the two protective muscles get tired that a tone is transmitted in such intensity as to injure the basilar membrane.

There is undoubtedly a definition of sound in the cochlea; but there is also a center of acuteness of hearing in the cervical cortex itself. Must have some action on definition of tone as well as the action of the nerve cells in the neighborhood of the basilar membrane. The actual perception of tone in its finality must be in the cervical cortex itself.

The ear parts are only a small part of the hearing mechanism. Undoubtedly, the essential portions for hearing are almost entirely in the cervical cortex.

I do not feel competent to discuss the theory of hearing which Dr. Fletcher has brought forward to you. This, to my mind, illustrates one of the strangest points in the story of modern medicine. Nowadays the progress of medicine is going to come by combination of the clinical knowledge of the physician and the scientific knowledge of the scientist. There can be no advance except by such a combination, as shown in meetings such as this.

From my thirty years of practice of otology, two interesting points occur to me:

1. Thirty-five or more years ago, when the telephone was invented, the invention of the telephone itself was made by a combination of three individuals—a physicist, a teacher of the deaf, and a physician. In this meeting we are coming to the first combination of a similar group of individuals. Much may be learned by such combinations in the future.

2. Up to the time of this modern theory of hearing, which Dr. Fletcher has presented to us here, there remains only one workable theory of hearing for over fifty years. This is the theory of resonating—the theory of Helmholtz, which was developed between 1869 and 1873. It is remarkable that there should be an undisputed theory for so long which is only now being replaced by a substitute theory.

I wish to thank Dr. Fletcher for the theories he has given.

DR. W. H. HASKIN, New York: I believe there is a psychologic factor in deafness. As deafness increases, the deaf become like hermits; they shut themselves out. I do believe that in that shutting themselves out they actually lose the vitality of many of the nerves in the cochlea. From my practice, I think we will find a great deal of delayed cerebration. The deaf person hears a sound, and there are so many sounds he must interpret that he cannot interpret them fast enough—he is constantly under a strain.

PROF. FREDERICK A. SAUNDERS: Perhaps what you would like me most of all to do would be to be brief—and that I am very happy to be, for the reason that the researches of which we have heard are so entirely beyond criticism.

We have an example here of the wonderful research policy adopted in this country, particularly, I think, by our larger institutions, such as the Bell System. We should be proud to think that we have in this country such well equipped institutions. They have at least far more than anybody else has in the way of equipment. The institutions protect their good men and allow them time to work; and I think that policy is most important.

In these days, we so depend upon material things. There are a thousand things about a laboratory which make this kind

of work possible. It is an enormous and beautiful example of cooperation among scientific men. How they ever accomplished anything twenty years ago I do not know.

I was particularly interested in the features of Dr. Fletcher's address which have to do with the analysis of tones. This is an age-old subject. I happened to have the privilege to see this work some years ago. The work Dr. Fletcher has given is infinitely better than anything we have ever had before.

Tonight we heard that our ears are rather bad; they do not hear all that is introduced—they do hear some that is not introduced into them. We must be cautious what we believe.

I am glad that, as a physicist, I am not supposed to know anything about the inside of the ear. I think our musical friends may well look into the matter of quality of reproduction. It would seem not impossible to teach singing by some such instrument, and to reproduce a given quality of voice by this.

I need not say how important tone analysis is in other directions, as in the matter of the telephone and radio.

It may be interesting to note that tone analysis comes into connection with dollars and cents. Take the matter of a fog horn. We have to spend a good deal of money in producing noise. A good deal of power goes into parts of noise not of much use in reaching greater distances. Three-fourths of the power is absolutely thrown away in making noise which is not heard at any distance. It would be economical to make an accurate analysis of the tone of such a horn.

Sound analysis comes in in connection with the application of sound in architecture—quality of chamber, furnishings, character of wall.

Sound is beginning increasingly to serve mankind. It is used in war to locate the position of enemies, as in the case of airplanes. Ships at sea obtain depths of ocean by means of echo. We may hope possibly to obtain knowledge as to the presence of icebergs by sending out sounds and listening to the echo.

Passage of sound through the ground—used as aid in mining operations.

What new uses—impossible to predict. Going to be of increasing importance.

I think we should all be grateful to the Bell System for encouraging such men as Dr. Fletcher; and to Dr. Fletcher for giving us the benefit of his researches.

MR. WALTER GOODRICH: Of all musical instruments which have gone under more or less change, the human voice has undergone practically none. We do not know what may happen when the apparatus we have heard tonight is reduced to pocket size. Improvement has undoubtedly been along the line of training of the voice and involving the elocutionist.

You are to hear tonight something about this matter of tone production from someone who is particularly well fitted to speak—peculiarly well fitted to speak with authority, and I think we should also not forget that he is one who has actually been successful in teaching the deaf to hear and the dumb to speak.

PROF. ARTHUR E. KENNELLY: Some philosopher originated the proverb that there's many a slip between the cup and the lip. We might add that there is many a slip between the ear and the lip in acoustics. Some have been explained and amplified by the very remarkable demonstration Dr. Fletcher has made for us this evening. Between the ear and the lip there may be the wave motion in the air acoustically, the electric wave motion over wires or without wires by radio in the air; and these electric transmissions have enormously increased the range of vocal transmission. Previously it was possible to transmit a message only a few hundred meters at most; now it is possible to transmit kilometers. People in South Africa have danced to music from North America transmitted through London.

PROF. F. S. DELLENBAUGH: I neglected one point of psychology this evening. I only have a few pages of notes. Usually I bring out a ream of paper; and then, no matter how long I talk, people are always glad because it is so much less than they expected.

As a matter of fact, it was asked a while ago that written discussions be put in for the archives of the society. I wrote a discussion, but I don't expect to pay any attention to it now.

One thing I want to do is to take you a little behind the stage, and tell you what was done to produce the effects tonight. It sounds like radio and looks like radio. As a matter

of fact, about a week ago—possibly a little earlier—the N. E. Tel. and Tel. was authorized to put in such apparatus as they had as was needed for this demonstration. Four men worked at odd moments, when the hall was not being used. They succeeded in putting in the amplifying equipment which is necessary.

Last Wednesday, Mr. Kelty and an assistant of his came through from New York, and they have been working with the four men from the New England Telephone Company since Wednesday morning. Dr. Fletcher himself arrived yesterday morning, and he came over and spent a good deal of time looking into the work and in the rehearsal yesterday. They came back last night after the orchestra was through with the hall. I left about midnight; and the gang was still here.

There were a good many involved, who had to authorize the use of apparatus.

I should like to take you back of the stage and show you some of the things that have been done in preparation for this evening.

In a little cellar there is a motor generator set which converts the power into the proper kind for operating the amplifier. In the control room there are two panels, 3 by 7 feet. Nothing on them, practically, but amplifying apparatus. The rest of the dressing room is filled with amplifying rheostats.

The green room has been used as the studio. The ordinary room has so much vibration that it has to be deadened. The Johns-Manville Company lent us a number of rolls of felt. The piano had to be played with rolls of felt taken up and put down again until the sound was right.

Then, of course, we had to have telephones, to connect the different operators. All the left of the wings is tables full of coils. There is a telephone at the back of the theater with one of Dr. Fletcher's men there, listening for volume and telephone the control room, and relaying Dr. Fletcher's messages. There is also a transmitter on the desk, leading to the studio.

Here we have this enormous number of men, and it takes an enormous amount of cooperative effort to make it work.

I think Dr. Fletcher is to be congratulated in having everything work so nicely, because it is a very difficult demonstration to put in.

None of the local engineering bodies who originally thought they were primarily interested in it had a sufficiently large organization to make it worth while to put in this elaborate demonstration. So when the Boston Section of the A. I. E. E. tried to include it in their program it was impossible to get it for them alone. We found that Dr. Fletcher was closely in touch with the otologists, and so we got together with them. It was extremely gratifying to find that a convention of the L., R. and O. was going to be held; and their cooperation went through beautifully. We also included other engineering organizations and invited many that were not cooperating.

I should like to take this opportunity of thanking the medical society for their help and interest in cooperating with it after the thing got started.

We think we are civilized because we are the last word, going the way we are going—résumé of written discussion.

DR. HARVEY FLETCHER, in conclusion: It seems to me this audience has been very patient. It took me longer than I intended; and I think you have been patient indeed to stay so long.

One or two points have been brought up by other speakers which I should like to mention.

DR. E. A. CROCKETT: If the auricles were taken from the ear—it makes no difference whatever how the transmission goes into the cochlea—the analysis is just the same. The mechanism analyzing the sound in every case is the same.

It seems to me that one point Mr. White made is worth some notice. He mentioned the fact that it would be very nice to standardize our speech. This is a nice opportunity for the teachers. We have developed a technic of electrical transmission so that we can record speech very accurately—more accurately than on phonograph records. We can record the various dialects throughout the country on records and reproduce them faithfully. Here is an opportunity to pick out what type of English is considered standard, put it on records and distribute it throughout the country.

In closing, I want to call your attention to one character in the papers. These papers were not intended to be a discussion of the demonstrations. Dr. Crockett took up the question from the human side—he is a doctor. Prof. Saunders took it up from the philosophic side—he is a physicist. Dr. White took it up from the artistic side—he is a teacher of music. Mr. Dellenbaugh took it up from the practical side, being a practical engineer.

## SOCIETY PROCEEDINGS.

### CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY IN JOINT MEETING WITH CHICAGO OPHTHALMOLOGICAL SOCIETY.

A joint meeting of the Chicago Laryngological and Otological and the Chicago Ophthalmological societies was held on Monday, March 2, 1925, at the Great Northern Hotel.

DR. E. P. NORCROSS, President of the first mentioned Society, presided.

The guest and essayist of the evening was Dr. Louise Pearce of the Rockefeller Institute, New York City, who delivered an address entitled

**"Specificity of Spirochetes in Diseases of the Eye, Ear, Nose and Throat."**

#### ABSTRACT.

The study of experimental syphilis in the rabbit permits of the investigation of numerous problems which have an important bearing upon the human disease, since many factors concerned in the experimental infections are known and can, to a greater or less degree, be controlled. Under these circumstances, therefore, an interpretation of the effect or significance of such factors is possible. In syphilis of man, the study of cause and effect is extremely complicated, and it is often difficult to arrive at any conclusion as to conditions which favor or prevent the occurrence of one form of the disease or another.

The conception of specificity, as applied to strains of *Sp. pallidum*, was founded upon clinical observation and has largely centered about syphilis of the central nervous system. From an experimental standpoint, no stronger evidence in support of the conception of "selective affinity" has been submitted than that first advanced by Nichols and Greene and by Reasoner, based upon the production of lesions of the eyegrounds. Less attention has been paid to the host or to conditions that exercise their influence through the host, and consequently there has been a strong tendency to attribute clinical variations in the course of the disease to differences in the biologic properties of spirochetes rather than to differences in animal con-

stitution or to the circumstances under which the infection was contracted.

The three factors of foremost importance concerned in determining the course of syphilitic infection are: (1) The causative agent of the disease; (2) the resistance of the host; (3) the circumstances under which the infection occurs. In reality, each factor consists of many elements or subdivisions, all or many of which may play significant rôles in the reaction, and the result of which is seen in the particular example of the disease observed. No fixed value can be assigned to any of these factors. Some of them tend to increase the severity of disease or predispose to the development of certain types of lesions, while others neutralize these effects or tend to reduce all manifestations of disease to a minimum, and it is evident that a given result may be brought about in a variety of ways.

In experimental syphilis of the rabbit, one of the most striking features is the great variation in the disease picture, both as regards the primary and the generalized lesions. An example of this is seen in the lesions of the eye. The liability of this organ to involvement is greater than that of most tissues, since it is not protected to an equal extent by the general reaction that takes place in other parts of the body. Almost any recently isolated strain tends to produce a considerable number of eye lesions, and apparently some organisms are more prone to the production of lesions of this class than are others. Moreover, there may be distinct differences in the character and severity of the lesions produced by organisms derived from various sources. However, none of these properties appear to be attributable to fixed biologic characteristics, for with continued passage the incidence and severity of eye lesions may increase or diminish and both the character of the lesion and the time of its occurrence may be affected. In addition, with a given strain of organisms, a change in one direction may be followed by a change in the other. The occurrence of such variations suggests that the tendency displayed by certain organisms to the production of particular types of lesions represents an expression of an existing state of balance between the organism and host rather than an inherent predilection on the part of the organism.

The part played by the host in the evolution of the disease may be studied experimentally in many ways. The factors of sex and certain physiologic states, such as pregnancy, profoundly modify the course of infection. As a rule, the manifestations of disease are less numerous and less pronounced in female rabbits than in males, while pregnancy usually exercises a still greater restraining influence over the incidence and development of syphilitic lesions. Another example of the influence of the host is seen in the different type of disease produced by the well known Nichols strain of pallidum handled in such a way as to favor the host rather than the organism. This has been accomplished by the testicular inoculation of the popliteal lymph nodes of rabbits which had shown no syphilitic lesions for a considerable period of time. Successive generations have been inoculated in this manner during the last five years. Animals inoculated according to this procedure have shown no generalized lesions other than a metastatic orchitis. On the other hand, rabbits inoculated with the same strain intratesticularly at comparatively frequent intervals, using emulsions of infected testicle, have continued to show an infection characterized by the development of lesions in remote parts of the body, such as the periosteum and bone, the skin and the eyes.

The variation in the disease picture among a group of five or ten rabbits inoculated with a given strain and by a uniform procedure, such as the intratesticular or the intracutaneous route, is a characteristic and striking feature of syphilis of the rabbit. In such a series the proportion of severe, mild and intermediate grades of disease, as determined by the number, severity and duration of lesions, is roughly 1:1:3. While the general grade or severity of the infection may vary within rather wide limits from time to time, these values are relatively constant for any strain at a given time. The course of the disease, therefore, would seem to be determined to a large extent by the sensitiveness of the animal and the promptness and efficiency of the defensive reaction, which are expressions of animal constitution and animal economy. And in this connection it is significant of the character of the disease that one can produce with a given strain of *Sp. pallidum* changes with the season of the year or from year to year. Thus, dur-

ing the summer months, the disease is always comparatively mild, while the periods of greatest severity are spring and fall.

The circumstances under which the infection occurs or is initiated are likewise of great importance in determining the course of the infection. An infection produced by spirochetes whose vitality is low will not be the same as one produced by organisms that are highly active. In general, such an infection is initiated slowly with comparatively minor primary lesions, but its general character is often insidious, for it may progress much farther than one that assumes more severe proportions during the early stages. In like manner, infections produced by different routes of inoculation tend to pursue different courses. Thus, the manifestations of disease resulting from an intratesticular as compared with an intracutaneous inoculation, using comparable amounts and strengths of inoculating doses, tend to be more numerous and severe, although they may not be more enduring. Again, the disease picture produced by the application of an emulsion rich in spirochetes to the normal mucous membrane of the conjunctival sac or the sheath differs in many respects from that produced by intracutaneous or testicular inoculation. It was found that a simple instillation of a spirochete emulsion into the conjunctival sac or sheath was all that was necessary to obtain an infection. The infection thus produced, however, tends to pursue a mild or asymptomatic course and frequently without the development of a characteristic chancre. It is also possible to modify the character of an infection by various procedures carried out at the time of inoculation or shortly thereafter. Thus, significant differences are observed if one inoculates one or both testicles, or if the inoculated organ is castrated soon after inoculation, or if insufficient treatment is administered early in the course of the disease.

It is apparent, from these experiments, that there are many factors in the biology of syphilitic infections which operate in the production of the disease picture. There is a great deal of evidence to show that under a given set of conditions and at a given time in the life history of an organism, the properties possessed by it may increase or decrease the liability to the occurrence of lesions of a given type. However, we are not justified in assuming that there are distinct strains of pallidum

capable of producing entirely different types of disease, unless it be clearly understood that such properties may be lost or acquired by any strain and that in any case the action of such organisms is subject to the operation of outside influences which may completely nullify any existing tendency on the part of such organisms.

(Lantern slides illustrated various lesions of experimental syphilis in the rabbits and included (1) types of primary orchitis and chancres and of generalized lesions, such as those of the bones, periosteum and tendons, the skin and mucous membranes, and the eyes; (2) primary and generalized lesions of individual animals; (3) variations in the character of the disease produced by strains of spirochetes well adapted to the rabbit (high virulence) and by those of recent isolation (low virulence); (4) variations in the disease picture produced by differences in the route of inoculation—testicular, intracutaneous and mucous membranes, and by various procedures, such as castration and insufficient treatment instituted at various times after inoculation; (5) variations in the disease of males, females and pregnant females; (6) charts and tables summarizing the significant differences in the disease resulting from various procedures carried out to show that conditions operating through the host can, of themselves, determine the course of the infection and thus bring about striking variations in the character of the lesions which, if the circumstances of the experiment were not known, might be interpreted as due to specificity of the particular organism used.)

#### DISCUSSION.

DR. D. J. DAVIS, head of the Department of Bacteriology and Pathology, University of Illinois (by invitation), said that Dr. Pearce's study represented very well the proper relationship which should exist between laboratory and animal experimentation and the study of diseases that exist in the human. Progress in this field, if analyzed, could be seen to be dependent very largely upon the proper coordination between these two fields of work. So often the one supplements the other. He believed that this mode of study of disease should be applied particularly to those diseases of a chronic character where solution is often difficult.

The number of spirochetes that are of interest to medicine is multiplying very rapidly. Dr. Davis has done little experimental work with syphilis, but has been interested in other members of the group of spirochetes, and thought it might be interesting to present certain work done on spirochetes with special reference to putrid and gangrenous infections. Certain spirochetes are often associated with fusiform bacilli and a pyogenic coccus in their disease activities. These organisms furnish an excellent example of how bacteria may cooperate, in this way causing serious infection. Any one of these organisms operating alone would do little or no harm.

The fusiform bacillus is an anaerobic organism, stains very readily, grows easily in animal tissues, as stated, frequently cooperates with the spirochetes. The fusiform bacillus and the spirochetes together belong to a group which we frequently refer to as opportunists. By this term we mean that they do no harm ordinarily until proper conditions arise furnishing them an opportunity to exercise their potential pathogenic powers. In dealing with these opportunists, the location of the infection is determined very largely by the normal distribution of these organisms. This is a very important rule or principle which has not been sufficiently emphasized. For example, most staphylococcus infections occur in the skin or near the skin because the normal habitat of this organism is in this structure. Likewise, streptococcus infections chiefly occur about the throat, because these organisms normally occur there, and this same principle applies in connection with the activities of other microorganisms.

From their studies of the fusospirochete group they have found that these organisms normally occur chiefly in four localities about the body. First, in the crypts of the tonsils, in which these organisms occur either diffusely, growing on the crypt mucosa, or are found in well defined raylike granules known often as actinomyceteslike granules. These latter have nothing whatever to do with actinomycosis, but are masses of organisms chiefly fusiform bacilli, spirochetes and cocci, together with *leptothrix* threads. They are very commonly found in nearly all individuals at times. Second, the teeth, where these bacteria tend to grow around the tooth just at the gingival margin. They appear in granular forms, some-

what similar to the granules in the tonsil crypts. Third, they are found in certain parts of the gastrointestinal canal, especially in the region of the appendix, and fourth, they appear about the genitalia in both male and female, especially in smegma deposits. They may occur occasionally in other localities.

(Dr. Davis presented a series of lantern slides demonstrating these organisms and various lesions resulting from their activities.) It is interesting that the lesions caused by the activity of these organisms frequently occur in the region of the mouth and especially the upper respiratory passages. For example, in alveolar abscesses, one very often finds, in addition to streptococci, fusiform bacilli and Vincent's spirochetes. If anaerobic cultures and smear preparations are very carefully made these organisms can be found often in many but not in all such lesions. It should be pointed out, too, that a characteristic odor so often noted is caused by these two organisms and not by the streptococcus. In putrid sinus infections and also in putrid otitis media, these organisms invade secondarily these localities and modify essentially the character of the lesion. Very often, too, these organisms pass down from the teeth and the tonsils into the lungs. Here, if conditions are suitable, a putrid type of bronchitis or pneumonia may ensue. It is this type of pneumonia that is particularly apt to follow tonsillectomy, extraction of teeth, anesthesia and the like. Dr. Pilot, working with Dr. Davis, has studied many cases of gangrenous and putrid bronchopneumonia, nearly all of which are complicated with this type of infection. In such lungs these organisms appear often in enormous numbers, the spirochetes occurring in large tangled masses, and the fusiform bacilli occurring in large numbers together with pyogenic cocci, usually the streptococcus. In tuberculous lungs invasion by the fusospirochete organisms is rare. It occasionally occurs, however, and then the sputum becomes very putrid and contains many of these organisms, and the lung tissue tends to dissolve and become gangrenous, usually in localized areas. Occasionally the organisms evidently pass into the blood stream, for as a complication of these lung infections putrid abscesses of the brain are prone to occur. These may be single or multiple. Rarely do they metastasize to other parts of the body. Fuso-

spirochete organisms, usually with streptococci, very often occur normally about the genitals, especially in the smegma, and here when conditions are suitable, especially in persons with a long prepuce, these organisms may rapidly develop and cause an erosive, at times a gangrenous, balanitis. The process may rapidly extend, involving the genital organs.

Experimentally, they have found that the rabbit is quite easily infected with the fuso-spirochete-pyogen combination. When injected intrapleurally, putrid, extensive empyema rapidly develops, which may kill the animal in seven to ten days. If the dosage is small, the process may heal, the spirochetes apparently disappearing first. If death ensues, it is usually due to a generalized streptococcus septicemia, the streptococci being found in the heart's blood and in the other large cavities. This indicates that the pyogenic bacteria in these processes are the most virulent and most aggressive, the fusospirochete organisms usually remaining behind and modifying essentially the character of the local primary lesion.

DR. PEARCE, in closing, said that they always welcomed an opportunity to attend clinical meetings and occasionally to speak at them. They feel that while the laboratory workers are doing their best to contribute to this subject they have often been outdone by the clinician, and then when they attend such meetings they frequently learn more than they give.

THE CHICAGO LARYNGOLOGICAL AND OTO-  
LOGICAL SOCIETY.

*Meeting of Monday, January 5, 1925.*

THE PRESIDENT, DR. EDWARD P. NORCROSS, IN THE CHAIR.

**Presentation of Specimens**

DR. GEORGE W. BOOT presented a roentgen ray picture of the chest of a boy who had inhaled a cork which completely closed the left bronchus. No air entered the left lung, and the left lung gave a dense shadow throughout its whole area. The father tried Christian Science for two months before he was referred to Dr. Boot by Drs. Ochsner and Pollard. Dr. Boot removed the cork by lower bronchoscopy. The patient had a lung abscess and coughed up large quantities of foul pus but has recovered.

Dr. Boot also presented a specimen of cancer of the antrum in which it was necessary to remove everything from the roof of the orbit to the floor of the antrum, including the eye and the inner wall of the antrum, and back to and including the anterior wall of the sphenoid. In spite of this extensive removal the patient is in good condition, but has a local recurrence of the cancer without metastases.

Dr. Boot then presented the brains from two patients who died as the result of brain abscess. One was a metastasis from a sore throat and was a superficial abscess in the region of the speech center in the third frontal convolution. The other was an abscess of the left temporosphenoidal lobe that ruptured into the lateral ventricle. This patient had no aphasia. Her temperature jumped from normal to 105° F., and her pulse from about 57 to 150 at the time the abscess ruptured.

**"Schaefer-Galton Whistle."\***

BY ROBERT SONNENSCHEIN, M. D.

**DISCUSSION.**

DR. HARRY L. POLLOCK said they had discontinued the use of the whistle because analysis showed that it was not accurate as compared with the monochord. In this way they can get

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\*See page 878.

both air and bone conduction, and there is no comparison between the accuracy of the monochord and whistle in obtaining upper tone limits. The Schaefer-Galton whistle had been useless in their hands since they obtained the monochord, for with that instrument they can set the fret for any tone they wish. It covers the whole range and is very easy to use, because one can obtain both air and bone conduction with the same instrument.

DR. AUSTIN A. HAYDEN requested Dr. Sonnenschein to demonstrate the use of the whistle a little more fully.

DR. JACQUES HOLINGER said the objection to the whistle as an instrument to test hearing for highest pitch is that in the higher octaves a quarter of a turn of the piston has quite a different effect on pitch than in the lower octaves. Edelmann recognized this and tried to correct it by means of the chart. They attempted to overcome the difficulty with the monochord and succeeded to a considerable degree, but the gauging by dark figures or any other method is inaccurate in very high pitch.

DR. ALFRED LEWY asked if any other kind of metal had been used in the whistle to overcome the erosion occurring in the old instrument.

DR. JOSEPH C. BECK asked what objection there was to using greater air pressure by means of compressed air.

Dr. Sonnenschein (closing), in reply to Dr. Holinger in regard to the relation between turns of the pipe length, said that Edelmann tried to correct this by using the chart. As long as calibrations are made correctly they will show the definite pitch, depending on the pipe length.

He did not know whether the metal employed in the new whistle was different from that in the old, and whether it was noncorrosive. Neither did he know whether the Edelmann-Galton whistles were made with the definite air pressure or not, for the chart did not show it. But the chart of the Schaefer whistle states that it is made with 9 cm. of mercury, which is a definite air pressure. If one used compressed air he would not know just what pitch was being produced unless he had the whole whistle calibrated at that pressure. With the old Edelmann-Galton whistle one can use almost any pressure, depending upon the mouthpiece and width of the

pipe. Schaefer states that with the mouthpiece at zero and the pipe at 0.2, unless there is tremendous air pressure one cannot produce a sound. Dr. Sonnenschein could see no objection to compressed air if the whistle was calibrated properly.

He demonstrated the whistle in which Schaefer said the highest tones were produced by 2 m. If one determined that the patient hears at 3 mm., this is 17,000 vibrations. Then set the whistle much lower, at 10,000 or 12,000 vibrations, and then approach the high point.

**"Some Observations in the Treatment of Deafness by the  
'Acoustic Method.'"**

By SAMUEL SALINGER, M. D.  
(AUTHOR'S ABSTRACT.)

This is a report of our results in a series of sixteen cases treated with amplified tone. The machine employed is built on the principle of the radio. The sounds are obtained from an ordinary phonograph, playing any desired record, and are conducted through a series of vacuum tubes amplified by batteries and controlled as to intensity and volume by means of convenient rheostats. The amplified tones are then conveyed to the patient's ears by means of a regular radio headpiece. It is possible to increase the intensity of the sounds produced by the phonograph up to the point where they may even cause pain. It is the claim of the producers of this instrument that, no matter how far gone the hearing may be, it is possible to reawaken the perception by means of this excess tone stimulation, and develop it by repeated applications of the loud sounds. Even though the end organs be destroyed, it is claimed tone perception can be developed in the brain if the sound be loud enough to reach it. Also, it is claimed that in conduction deafness the vibrations produced by the loud tones directly at the ear will help to develop the responsiveness of the ossicular chain and muscles and thus result in improved hearing.

All of our cases were carefully examined prior to the beginning of treatment, a diagnosis established and accurate hearing tests performed. The treatments were given from three to six times per week, and the average session lasted about forty-five minutes. The hearing was retested at intervals of two weeks, and no case was here recorded that did not receive a final check-up at the end of the course of treatment.

It must be added at this point that we examined a total of forty-eight patients who presented themselves for treatment; nearly all of these began taking the treatments, but for some reason or other the majority either quit entirely or took them only at irregular intervals. As a consequence, only sixteen persisted with sufficient regularity to permit the deduction of reasonable conclusions.

Six were cases of nerve and labyrinth deafness. Of these, one was improved, one was worse, two showed no change and two were doubtful. Six were cases of otosclerosis. Of these four were worse and two doubtful. We had four cases of conduction deafness, of which one was improved and three were worse. The cases that showed improvement were very much in the minority, and one would have to be cautious in attributing this improvement to the treatment, knowing as we do the psychologic effect of a new method of treatment on impressionable individuals, and also keeping in mind the fact that some cases improve spontaneously under certain conditions.

One significant fact which the treatment brought out was the reduction of hearing for high tones in six cases. It bears out our contention that the treatment is harmful, from the fact that the repeated and continual application of loud sounds to the ear must inevitably lead to degeneration in the organ of Corti, as has been often proven, both by experiments on animals and by observation of patients who work in noisy places.

#### DISCUSSION.

DR. OTTO J. STEIN thought that some of the members knew something of this socalled acoustic method while others did not. He had no personal experience with it, although he had seen the apparatus and formed an opinion. Dr. Salinger's report on sixteen cases showed only two in which there was any perceptible improvement, which was not a very good showing. The patients had some power of hearing. Attempts at stimulating hearing have been made for many years, and he believed no one would doubt that attempts made in the past had shown that remnants of hearing can be stimulated to a point of usefulness. He believed it was only a question of the method and its application that should be considered. The use of the

voice is the oldest method of stimulating the hearing apparatus and it probably remains the best today. The work of Love, Wright and Goldstein and others had demonstrated this. Attempts to devise apparatus and instruments to supplant the voice have been numerous but not very successful.

Dr. Stein has had some experience with the Myer-Rowan percussion apparatus, and believed it is better in these cases than the more complicated musical instruments.

He asked if the high frequency current had been used in connection with this apparatus.

DR. ALFRED LEWY said he had been requested to examine the instrument and informed the Deafone people that he had communicated with Dr. Salinger and knew his results. The agent then told him that Dr. Salinger had not used the proper technic and referred him to Dr. Max T. Goldstein. Dr. Goldstein told him he still had the instrument under investigation, and any use of his name was without his authorization until he had completed the investigation, and he requested Dr. Lewy to make this known to the members of the Society.

DR. ROBERT SONNENSCHEIN thought the Society should be grateful to Dr. Salinger for bringing out this paper, for it is very seldom that accurately controlled tests with various apparatus have been published. In the last few years extravagant claims have been made for such instruments, and many times these are based solely upon the psychologic effect which they have on the patients. In otosclerosis, for instance, whatever is done seems to have some effect for the time being, but this soon passes away, so properly controlled tests are of great value.

He did not think Dr. Salinger mentioned the degree of amplification of sound which was necessary to produce any improvement. As shown by the work of Wilson and Minton, it is often necessary to increase the intensity of the tone a million, a billion or more times. In such cases this is of no value, for it is impossible in most instances to increase the tone 200 or 300 times. If there is no improvement until this is increased a million or a billion times there can be no practical value, so far as the hearing of the patient is concerned.

DR. ELMER L. KENYON thought it would be well to consider the psychologic aspect of training the deafened by use of

speech words and sounds. One must bear in mind that the faculties of attention and concentration are under discipline during such training with the voice. Also that in using the voice to improve the hearing, the word which is used is analyzed in the procedure, so that the individual under training comes to appreciate certain emphatic sounds in the word, and realizes that those sounds must appear in that word. A deaf person who does not get the whole word but the word in part, finds this of hearing advantage. In "table," for instance, he may get two sounds that dominate the words "ay" and "l." Partly by lip reading and partly by the context and partly by the key sounds that he hears, the individual arrives at his interpretation of the word spoken. The benefit of such training is probably all, or nearly all, psychologic.

DR. GEORGE W. BOOT thought the falsity of some statements is so self evident that we should not take time to disprove them. That it is possible to restore a function lost by degeneration or overuse by still more overstimulation is one of them. Would one expect to cure a diabetic by feeding him sugar? Or restore sight to an eye blind from retinitis by looking at the sun? It is no less irrational to expect to restore hearing in an ear deaf because of degeneration of the organ of Corti by compelling it to listen to the noise of a Deafone or any other method of overstimulation. There are so many reasonable things to be worked out that we should not have to waste our time disproving such childish things as this.

DR. JOSEPH C. BECK expressed his thanks to Dr. Salinger for his very valuable contribution and for his carefully controlled work, which was unusual in such instances. The roentgenologic treatment, and that with other apparatus, has been much the same, and the statement has been made that they are "no good." Dr. Beck believed that the only way these unscientific methods of treatment could be downed was to accurately try them and then report the results. Many men had been asked to try this acoustic apparatus. His impression when he saw the apparatus was that it was like most of the others that have been devised for the treatment of deafness. It was impressive for the patient, but its value must be definitely determined. They had permitted the apparatus to be placed in their hospital, where they could treat the patients and observe

their attitude toward it, and then test the patients immediately after the treatment, and later see if there was any change for better or worse. They were treating a number of cases of marked deafness. It was easy to see that with this instrument some patients might be made worse, because if the apparatus was used by some inexperienced person it would have the effect of a gunshot near the head, so that most of the cases they had treated had been made worse immediately, but later some seemed to have improved, which he thought might be only the psychologic effect. He considered the instrument a nuisance to have around, because of the noise it makes, and was very skeptical in regard to its value.

DR. GEORGE E. SHAMBAUGH expressed his gratitude to Dr. Salinger for carrying out these tests. The results were exactly what one would expect, in view of what we know already regarding the effects of bombarding the ear with sounds. Degeneration rather than improvement is what really takes place.

He thought Dr. Kenyon had answered very well the question as to whether there is actual improvement in hearing due to stimulation of the end organ by exercising the voice, as has often been claimed. He became interested in this question from the work of Victor Urbantschitsch in Vienna many years ago. In observing this work it seemed to him that the apparent improvement in hearing was nothing more than an education of the cerebral function in putting together slight fragments of hearing, recognizing them as certain words. This same process is what one always does with normal hearing in a large lecture room; one never hears all that is being said, but pieces out—a cerebral rather than an aural function.

Dr. Shambaugh related an experience he had with a physician and an otosclerotic patient last year. The patient was referred to him for a quantitative test of hearing. She was at that time recovering from a prolonged, severe infection of the nose and throat. The doctor had some supposed solution of radium which he administered to this patient, and after a few weeks Dr. Shambaugh was asked to reexamine the patient and found that there was a distinct improvement in the hearing, which, of course, was not attributable to any solution of radium or any other treatment but was what one has learned

to expect in patients suffering from otosclerosis after going through the depression of an infectious head cold.

DR. HARRY L. POLLOCK asked Dr. Salinger if the treatment made any impression on the tinnitus, which was present in some cases.

DR. SALINGER (closing) said that the patient receives the amplified tone through the apparatus, tones which are amplified up to a point where he perceives them. He was instructed that the patients should receive not less than 30 or more than 60 minutes of this treatment at a time, the average period being 45 minutes. The patient hears one or more phonograph records played over and over again for that length of time. He did not use the high frequency current in connection with this treatment. There was no change whatever in the tinnitus.

With reference to the impressive size of the cabinet, Dr. Salinger said that it was large because it was provided with sufficient attachments to treat twelve patients at one time. A smaller cabinet, with only one or two headpieces, could just as well be constructed.

He pointed out that in connection with the apparatus the microphone attachment might be developed into something useful. They have a microphone by which the human voice can be amplified and conducted to the headpieces over the patient's ears, and he thought this might be of some value. Many of the deaf children whom he had examined were able to distinguish vowels by this means, and he thought possibly it might be of service in training and developing their speech. However, even if the deaf could be made to hear the tones of increased intensity, this was of no practical value, because one cannot, under the normal conditions of daily life, bring the human voice or a musical instrument up to that intensity.

**"Mastoiditis: Delayed Operation in Four Cases."\***

By C. J. SWAN, M. D.

DISCUSSION.

DR. ALFRED LEWY agreed that there is such a thing as waiting too long before operating in mastoiditis, as occurred in the cases reported by Dr. Swan, although through no fault of his.

\*See page 869.

There is also such a thing as operating too early. The Society had recently listened to a paper by one of its members, reporting over 200 cases operated on very early, with a mortality of 11 per cent, and a morbidity of 17 per cent, surely not an enviable record. There is a right time to operate, and therein lies the function of the otologist: to determine the right time. One cannot wait three weeks in all cases; in some one cannot wait one week, but cases requiring operation within one week have been rare in his experience. He has seen patients die of meningitis within three days of the onset of earache, and only recently had a patient who died of meningitis within a week of the onset of ear symptoms. The postmortem showed the ear merely as coincident, not causative, of the meningitis. Such cases are blood stream infections with meningitis as the terminal lesion.

In Dr. Swan's description of Case 1, the condition of the dura was not mentioned, and Dr. Lewy asked if this case appeared to be one of direct extension or whether the ear was a part of a general infection including leptomeningitis.

Case 2 came to Dr. Swan late. Case 3 was undoubtedly sinus thrombosis, and the symptoms indicating operation were clear when the parents refused operation. Case 4 came into Dr. Swan's hands with subperiosteal abscess already developed. Operation was clearly indicated.

Dr. Lewy thought that in none of these cases would the proper time for operation have been overlooked by a competent otologist.

He also asked Dr. Swan why he used the term "edema," and why this description continues to appear in the textbooks as a symptom of mastoiditis. In his experience edema over the mastoid is commonly associated with furunculosis of the canal, as distinguished from infiltration of the periosteum which appears with mastoiditis. It is largely due to round cell infiltration, feels fairly hard and obliterates the little irregularities of the surface of the mastoid process. When there is perforation of the cortex and extravasation takes place beneath the periosteum fluctuation appears. What Dr. Lewy understands by edema is a watery extravasation into the tissues which pits on pressure and is characteristic of furunculosis rather than mastoiditis.

As to the indications for operation, they are numerous, but the decision to operate does not rest upon anyone, but upon the entire picture studied in detail. To his mind, the most important are not the local symptoms but the general condition. First, the appearance of the patient; he looks sick; he has the waxy pallor of sepsis. Second, the presence of insomnia, and these, he thought, would take precedence over the usually described local symptoms. It will generally be found that the local and general symptoms correspond.

DR. CHARLES M. ROBERTSON thought otologists should talk less about any particular time to operate, as this does not enter into mastoid surgery at all. The purport of the whole matter is the resistance of the patient, the amount of infection present and the character of the infection. He believed that in mastoid surgery one should also disregard external swelling and the sagging of the posterior superior wall, as these are unreliable in mastoid surgery. The cases in which any doubt exists are those in which these symptoms are not found, and in his opinion the safest method of telling when to operate and when to wait is to take the blood picture and ascertain the extent of the infection. Dr. Swan in his four cases made a complete analysis of the bacteriology, and that helped him to decide whether or not the cases should be operated upon immediately. He agreed with what Dr. Swan said, and thought one could tell exactly what was going on in the body by means of the blood picture. The blood culture is hard to make, and he thought it not safe to place too much confidence in the culture, but that the picture of the blood will always tell just what condition is present and what may be expected. If the infection is due to staphylococcus or some germ that is slow in decalcifying the mastoid, slow in eating the patient's resistance, one can afford to wait. If, on the other hand, there is a virulent organism at work, the surgeon must operate quickly if he expects to save his patient.

Regarding complications, Dr. Robertson is firmly of the opinion that every operation on the mastoid should be made so that the sinus and dura are both exposed, so that one can make a thorough examination and discover whether there are any necrotic spots, whether the dura looks healthy, and whether the brain is under pressure or the sinus thrombosed. If this

were done there would be a less percentage of complications than are now present in mastoid surgery.

DR. SONNENSCHEIN asked Dr. Robertson to describe the character of the blood picture which he considered as a prognostic sign.

DR. ROBERTSON said that he always watched the differential white count, being guided by the polynuclear per cent. If the polymorphonuclear count becomes high the small leucocyte count becomes low, which shows lowered resistance. If the polymorphonuclear count is below 70 per cent, he is willing to wait; if above 70 per cent he is willing to operate.

He related the case of a patient with mastoiditis who was operated on by a friend of his. Dr. Robertson saw the patient in consultation at 1 p. m. At that time the blood picture showed about 8,000 white cells with 55 per cent polymorphonuclears and 25 per cent mononuclears. At 4 p. m. he made the diagnosis that the patient was in the calm before the storm. At that time the leucocytes were up to 9,000, with the mononuclears up to 18 per cent or 20 per cent and the polymorphonuclears 65 per cent. At 8 p. m. the polymorphonuclears were 77 per cent and the next morning at 8 o'clock the white cells were 22,000 with 8 per cent mononuclears and 95 per cent polymorphonuclears. The jugular was solid from the bulb down to the clavicle. The patient should have been operated at 8 o'clock the evening before but it was a hospital case and no word was furnished the doctor until the next morning. The patient recovered, but he believed this was due entirely to luck as the blood picture indicated that the operation should have been performed the night before.

DR. GEORGE E. SHAMBAUGH found himself somewhat confused as to just what Dr. Swan meant by "delayed operation." Did he mean an operation delayed after the recognition of the otitis media or after the diagnosis that this otitis media had involved also the pneumatic spaces of the mastoid, or did "delayed operation" mean delay after the appearance of some definite, recognized indications that the process in the mastoid had gone on to the point where operation was called for? After listening to the conclusions in Dr. Swan's paper he was left with the impression that by "delayed operation" he meant undue delay after the recognition of the otitis

media, since most cases of otitis media that are severe at all have an involvement of the mastoid. With this view he was not at all in accord. Very few cases of mastoiditis ever call for operative interference. The cases which Dr. Swan cited were all cases of neglected operation in which any well trained otologist would have no difficulty in recognizing indications for operative interference. If Dr. Swan really meant that every patient in which one was able to recognize mastoiditis should be operated within a week or less after the onset, Dr. Shambaugh did not agree with him.

DR. SAMUEL SALINGER stated that there are two general types of mastoiditis, one in which there is a predominance of local symptoms and another in which the constitutional symptoms predominate. The latter type seemed to be the one in which Dr. Swan's four cases belonged. In the type in which the local symptoms predominate one very seldom encounters trouble by waiting for a localization of the symptoms, decalcification of the bone and so on, and when one operates one feels confident of not overlooking anything. In the type in which the constitutional symptoms predominate he believed one could not operate too early. He recalled a case of this type which occurred in a young girl who had practically no local symptoms: the membrana tympani was incised and they got nothing but a little thin fluid. There were absolutely no local symptoms, but the patient continued to have chills and fever, and they finally decided to operate. Upon doing so they found a normal mastoid. The lateral sinus was exposed and found normal. They ligated the jugular and the patient got well. In that case there may have been a small thrombosed vein which they could not locate, but the patient had no demonstrable mastoiditis.

DR. EDWIN McGINNIS was interested in the type of mastoiditis with general symptoms, as mentioned by Dr. Salinger. The patient may have a tonsillitis giving general symptoms and also be the starting point of the mastoiditis. The mastoiditis does not clear up quickly, and in a patient with tonsillitis and a small amount of ear symptoms it is useless to operate on the mastoid unless one makes an attempt to eliminate the primary infection. One has to be quite keen in his diagnosis to deter-

mine whether there is only mastoid infection or whether there is both mastoid and general infection present.

DR. GEORGE W. BOOR has twice operated on mastoiditis on the third day of mastoid symptoms. Both patients died. The first patient had just finished a run of typhoid when he was taken with a severe nosebleed, which required packing of the nose for several days. Because of the nasal packing he developed an acute suppurative otitis in his right ear and a mastoiditis. He had had chronic Bright's disease, and because of this was totally deaf in the left ear and partly deaf in the right ear. In the hope of saving what little hearing he had, the operation was done early. He promptly developed erysipelas of the wound, cellulitis of the neck and choked to death.

The second case also had chronic Bright's disease. He was 73 years old and in poor condition, so the mastoid operation was done on the left side under local anesthesia. He, too, developed erysipelas in the side of operation but it cleared up. Then he had a right sided erysipelas which also cleared up. Finally, he developed erysipelas of the left leg, with multiple abscesses, and died of exhaustion.

DR. NORVAL H. PIERCE said the paper seemed to be an assault upon the socalled authorities who are advocating waiting in dealing with mastoid disease. However, Dr. Swan modified this assault by saying that he believed all men are endeavoring to operate at the proper time. He did not add to any of the indications for the proper moment for operation, nor did he give any information regarding the time which should be allowed to elapse. The cases he reported should be called neglected cases. Dr. Pierce thought it a great mistake to try to establish "schisms" in the profession, such as early operators or late operators. It is much better, as Dr. Swan said, to strive to be rational, and in order to become rational one must use every bit of knowledge which is obtainable regarding inflammation of the mastoid. Dr. Robertson had said that we should disregard calcification and sinking of the posterior superior canal, but Dr. Pierce thought we could not drop anything that is sound knowledge of mastoid inflammations. In his opinion, the sagging of the posterior wall and every available indication, although not conclusive in itself, is of value when taken in conjunction with the clinical picture as a whole in a given

case. Infiltration over the mastoid (infiltration, not edema) he considered a very valuable indication of involvement of the mastoid, but not necessarily conclusive as to operative necessity, especially when it occurs in the first few days of an acute otitis media. Tenderness, infiltration over the mastoid in the first few days of an acute otitis media are not in themselves indications for operation. The same symptoms at the end of the second week are indicative. There is no one local sign that in itself is conclusive regarding the proper moment for operating, before the stage of advanced infiltration, subperiosteal abscess or fistula. On the other hand, in the absence of all local signs an operation may be imperative.

It must be remembered that the process of decalcification is one of the great gains in understanding the pathology of mastoid involvement. It is not a matter of merely waiting or not waiting, but the symptoms, local and general, and time factor presented by the case must always be considered. In the ordinary mastoid inflammation it requires a certain length of time for decalcification to occur. This is not a matter of individual opinion but of general knowledge obtained by microscopic study, not by men in Chicago alone, but by otopathologists the world over. It is also known that in the mastoid inflammation extends in two ways, by the softening process (decalcification) and by the blood pathways. One must always take into consideration the age of the patient. The mastoiditis in an infant is entirely different from the mastoiditis in a child, and the same symptoms in the child have an entirely different significance from those seen in adults, largely because of the vascular supply and the morphology of the mastoid. He referred to fever especially, and infiltration or pain. The pathologic changes in the mastoid and their clinical manifestations depend also upon the specific germ that is infecting the individual. Type 3 produces an entirely different pathologic process from the streptococcus hemolyticus, which latter germ Dr. Pierce considered not so frightful as is ordinarily supposed. The type of mucosa has much to do with the course of the infection, and this can be judged by the roentgenogram. The character of the mucosa corresponds to the amount of pneumatization present. The bony structure of the mastoid in each individual case has an important bearing on the prob-

lem. One must use not only the local symptoms but the roentgenographic findings. He believed that the roentgenogram will undoubtedly gain in importance as time goes on.

In his opinion, in a case without external signs, without fever, and a considerable amount of pure pus coming from the external auditory canal, in the third week the mastoid should be opened. The mastoiditis which follows an ordinary cold or tonsillitis, in which the streptococcus is present in a well pneumatized mastoid, will be altogether different from a mastoiditis following measles or scarlet fever in the same type of mastoid. In one case the symptoms indicate opening the mastoid, but not in the other. One must consider the whole picture and be able to analyze it, and here comes in the experience and capacity of the surgeon who does the analyzing. The only person who is more dangerous than the man who operates too early is the man who operates too late.

Dr. Pierce thought Dr. Boot's remarks proved one could not operate with impunity in any case. When a patient takes an anesthetic he is in danger, and one should avoid as far as possible unnecessary operating.

Regarding the question Dr. Swan asked concerning complications resulting from early operation, Dr. Pierce believed that the greater number of cases he had seen in consultation had been cases which had been operated on early.

Dr. Pierce believed Dr. Swan placed an unfair burden upon the surgeons when he said that they must bear the responsibility of death in all these cases, because there are factors in the pathology of the mastoid which place many of these cases in the laps of the gods. Many elements in mastoid pathology are beyond the control of the surgeon, be he ever so learned, skillful and conscientious, and among the principal factors are abnormal vascular communications between the mastoid, the sinus, and especially the meninges. These abnormal vascular communications occur most frequently in connection with abnormal pneumatization and may become involved at the very onset of an acute otitis media. In a case seen recently the patient died on the second or third day after the beginning of an acute otitis media which was not severe. Dr. Pierce cited several cases in which very early operation had been performed without preventing the *exitus lethalis*, and stated that certain

of these patients will die regardless of what surgical measures are employed. He believed one should refrain from putting forth the edict that in death from mastoiditis the responsibility should always be placed upon the shoulders of the otologist.

Dr. Swan had criticized the concept that one should wait before operating unless there were signs of complications. Dr. Pierce had said something like this, having in mind the case of a child of six, with an acute otitis media following tonsillitis, in which paracentesis was done within twenty-four hours. A few days later the child had a violent chill, temperature of 106 or 107 degrees F., a high leucocyte count, no pain over the mastoid or swelling in the mastoid fossa. He recommended operation, and about two days later he was called to see the child in the night and upon opening the mastoid found it normal, then tied off the jugular vein, and the patient, after a rather stormy convalescence, recovered. This was a case of primary, isolated thrombosis of the jugular bulb.

DR. SWAN (closing) was very much interested in the discussion, despite the fact that some of the members did not understand the point he was trying to make.

The point Dr. Swan wished to make was that too much emphasis was being placed upon waiting. He had gained this impression from a meeting which he had attended, at which a great deal was said about the necessity of waiting until undoubted symptoms were present, not less than ten days, and nothing was said of the dangers of complications.

He agreed with Dr. Robertson in regard to operating at any specified time, and thought it was impossible to lay down definite rules for all cases.

Dr. Swan did not pretend to be able to add to the knowledge of indications for mastoid operation, and had no such intention in writing the paper. He agreed with Dr. Pierce that every case presented an individual problem and should be studied as such, as he stated in his paper. In many mastoid cases one does get pitting over the mastoid, and he likes to call this edema because that is what it is. In general sepsis, of course, no matter when one operates, the patients may die as the result of the general infection, but this condition was not included in his list of cases or in the idea of his paper.

